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S. HRG. 101-559

GLOBAL WARMING

HEARING

BEFORE THE

NATIONAL OCEAN POLICY STUDY

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED FIRST CONGRESS

FIRST SESSION

ON

U.S. ATMOSPHERIC POLICY AND GLOBAL WARMING

NOVEMBER 14, 1989

Printed for the use of the
Committee on Commerce, Science, and Transportation

U.S. GOVERNMENT PRINTING OFFICE

26-551 O WASHINGTON : 1989

S261-38

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

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U.S. ATMOSPHERIC POLICY AND GLOBAL WARMING

TUESDAY, NOVEMBER 14, 1989

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
NATIONAL OCEAN POLICY STUDY,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:32 a.m., in room SR 253, Russell Senate Office Building, Hon. John Kerry presiding.

Staff members assigned to this hearing: Penny Dalton, professional staff member, and Kevin Dempsey, minority staff counsel.

OPENING STATEMENT BY SENATOR KERRY

Senator KERRY. This hearing of the National Ocean Policy Study will come to order.

Dr. Bromley, I thank you very much for joining us on short notice. I know you are just back from The Netherlands yesterday and are probably still jet-lagged, as you were when we talked briefly yesterday. But we are very appreciative of your coming up here on short notice.

Obviously we are both concerned and curious. We wanted to explore with you the current position of the United States. We are pleased that some recognition of the scope of the problem of global warming and an acknowledgement of growing consensus came out of that Netherlands conference.

But while pleased that there was an acknowledgement, as you know, prior to the conference there were concerns here on the Hill about the reasons why the United States is not responding to that consensus or taking a lead with respect to that consensus.

The Dutch, the United Nations Environmental Program, the World Meteorological Organization, and others have all suggested that the time for action is now. The Executive Director of the U.N. Environmental Program said, and I quote him: "We know enough right now to begin action."

Within our own scientific community, the National Academy of Sciences and others, while there are discrepancies as to the degree of change and the predictions of some of the models, there is certainly a consensus about the range of change, that warming is taking place, and that the CO_2 emissions are the principal contributor thereto.

In addition, we have seen leadership, obviously, from Margaret Thatcher. We have seen leadership from Prime Minister Hawke of Australia. We have seen NOAA's General Fluid Dynamics Lab, the

Institute of Space Studies, Goddard, universities in England, the Soviet Union and elsewhere all contribute fairly significant and conclusive statements about this problem.

So it is not for me, Doctor, to belabor it. We asked you to come here in order to explore your thoughts and the Administration's position, but I simply wanted to frame our concern. We look forward today to exploring with you the current position of the Administration with respect to this issue and the Administration's current strategy and rationale. Again, I thank you for taking the time to share this with us.

Let me turn, if I may, to the distinguished ranking member, Senator Stevens.

OPENING STATEMENT BY SENATOR STEVENS

Senator STEVENS. Mr. Chairman, I have to go over to the Governmental Affairs Committee, but I dropped by to pay my respects to Dr. Bromley and also to make one comment.

Having been in Fairbanks last Friday night at 41-below, at the early part of November, it is hard for me to think that global warming is taking place. So I visited with some of our people up there and we do seem to have a dichotomy of opinion, Mr. Chairman.

My people up there, scientists, tell me that the oceans around our State are getting colder, that it is in fact a trend, now rather constant trend for a period of years, of getting colder. We started this year with a period in January, the longest period in history that it stayed substantially below 50-below in the interior of my State.

Now we have trouble reconciling global warming. And I want you to know, Mr. Chairman, I do not disagree that there is a substantial sentiment in the scientific community that that is the trend, but we find that hard to understand concomitantly with the cooling trend in the Arctic.

I wonder if you would have time to comment on that this morning, Dr. Bromley. As you know, the scientists up my way would like to do some drilling through the permanent ice cap in the Arctic and the Antarctic to see whether there is any record in that permanent ice of the changes that have taken place in times gone by.

I would encourage you to do that because we do not quite understand why there should be the concern over global warming if there is not the concern over the return of glaciers and the increasing intensity of cold weather in the Arctic and Antarctic.

Thank you, Mr. Chairman.

Senator KERRY. Thank you, Senator Stevens.

Senator Gore?

OPENING STATEMENT BY SENATOR GORE

Senator GORE. Thank you very much, Mr. Chairman.

Let me say before some brief opening comments that for some time some of the climatologists and modelers have noted that increased evaporation may cause some increased snowfall and intense variability with colder temperatures in some regions as a

direct consequence of global climate change. But from year to year all of them agree it is impossible to ascribe a particular year's variability to long-term trends or changes.

At some point the overall pattern becomes completely obvious. Dr. Bromley, let me just say in my opening comments here that you and I have had disagreements publicly on this before. Just before your departure for the Netherlands meeting we had an opportunity to discuss these subjects. I look forward to today's hearing.

The long debate over acid rain featured some scientific advisors to an administration determined that it would not act because political allies feared action. Even as the scientific evidence describing the disastrous consequences of acid rain mounted, the scientific advisors to the Reagan Administration continued to seize on each minute uncertainty to suggest that the time for action was still off in the future and the time for further study was still at hand.

Ten years later, the additional evidence about acid rain only confirms what was known ten years ago. The pattern of the evidence was abundantly clear at that time. The political objective of the Reagan Administration in avoiding actions that would cause discomfort to their political allies was met.

The scientists who allowed them to delay action may feel they did a good job. They may feel their reading of the scientific evidence was quite good. I do not. And I think their higher duty to the country as a whole was not discharged. I think we are seeing a repeat of this pattern.

There are uncertainties about the timing and intensity of global warming. The overall pattern, however, is so abundantly obvious that I think the higher duty of any scientist who has taken the time to carefully review the evidence is to alert the nation as well as the President to what is happening.

This pattern is not difficult to discern. The ice caps referred to by Senator Stevens yield a record of CO_2 measurements and temperature measurements which go up and down in parallel one with the other. Between the last ice age and the next-to-last ice age, the period of most warming in the 160,000-year time recorded in the ice cores, the level of CO_2 concentrations did not exceed 300 parts per million.

Because of our present activities, that level is now 350 parts per million. And when one takes into account the new chemicals invented in this century and measures CO_2 equivalence, then within a few decades the level will be 600 parts per million.

Now the computer modelers have conveniently chosen a doubling of the concentrations not because of any magic characteristic of a doubled concentration but merely as a way of facilitating communication between groups of scientists using different models.

But politicians and some of their scientific advisors have seized upon this doubling threshold as a kind of check point. Let us try to analyze what a doubling will produce, and if we are not certain what it will produce, well, we will just have to wait until we get there and then we will see.

I think that is madness. If we are going to double the concentrations that have prevailed in recorded history as an experiment, then the experiment itself is unethical. And I feel very strongly,

Dr. Bromley, that scientific advisors who adopt a position of cool distance from the evidence being observed do not serve their country well unless they look at the overall pattern and assess the likelihood of what it means.

I think it is also abundantly clear that it is a disservice to the country to give false reason for comfort to a political administration with the primary goal in this matter of avoiding actions which will make their political allies uncomfortable. I think that is what it is all about.

The uncertainty is being magnified and although I respect you deeply and agree with you on most of the other issues you deal with—you, sir, in your interpretation of this evidence have given comfort to a strategy of inaction and delay.

Ten years from now just as with acid rain, if your counsel is accepted, those who review the evidence at that time will conclude we have wasted ten years. Our options will have been limited and reduced. How in the world could anyone have looked at the pattern so clearly visible in 1989 and said the time for action is not now?

I look forward to the hearing. Mr. Chairman, let me say that I will have to leave and come back during the hearing, so I apologize in advance for that. But I look forward to the dialogue here.

Senator KERRY. Senator Gore, thank you for that opening and for helping to frame the issues that we face here today. I thank you very much for that comment and look forward to your participation.

We had originally intended this to be a joint hearing with the Senator's Subcommittee, and I want to try to treat it as jointly as possible, if we may.

Dr. Bromley, given that framework of questions both from Senator Stevens and the framework that Senator Gore and I have set, we look forward to your testimony and to a healthy, robust exchange this morning. I thank you again for coming.

I have an opening statement that the Chairman, Senator Hollings would like to have included in the record.

[The statement follows:]

OPENING STATEMENT BY THE CHAIRMAN

Good morning. There is some urgency in holding this hearing today, as there are specific global change issues which require our immediate attention. Foremost is the Administration's plan for dealing with the expected global climatic change caused by the proliferation of the so-called "greenhouse gases" and specifically the participation of a U.S. delegation in the recent Ministerial Conference on Atomospheric Pollution and Climate Change in the Netherlands.

I have been concerned for a long time about whether we as a Nation have a plan for dealing with the multi-faceted issue of global change. In this regard, on January 25, 1989, I introduced S. 169, a bill which would amend the National Science and Technology Policy, Organization, and Priorities Act to provide for improved coordination of national scientific research efforts and for a national plan to improve scientific understanding of the Earth system and the effect of changes in that system on climate and human well-being. This bill, which is the same bill I introduced last Congress, has been reported without objection by the Commerce Committee, as it was last Congress, and awaits full Senate action.

The recent reports concerning the U.S. position at the Netherlands Conference raise the same concern that my bill seeks to address. While other nations appear to be taking steps, or at least agreeing to initiate necessary measures, it seems we in the United States have yet to develop a game plan. Although we view this nation as a world leader on environmental issues, we have failed to take even the first step of admitting that we may be facing a serious long-term ecological threat from climate

change. Rather, we have teetered and tottered with the need to take action on the issue, and all the while, its effects appear to be manifesting themselves around us.

Atmospheric concentrations of greenhouse gases, like carbon dioxide and chlorofluorocarbons, are reaching historiclly high levels. World temperatures have increased about 0.6 degrees Celsius over the past century. The decade of the eighties has been the hottest in recent memory. And, while scientific evidence corroborates what our eyes see, the Administration seems reluctant to commit this nation to deal with the problem. I am concerned that the U.S. position at the Netherlands Conference is yet another example of this ill-advised reluctance. Unfortunately, the failure to make a commitment toward positive action may be pushing us ever closer to the precipice of environmental catastrophe.

Perhaps the gentleman here today can give us some answers as to where we are heading. We have the President's Science Advisor, Dr. Allan Bromley, who was a member of the U.S. delegation to the Netherlands conference. Also joining us are Christopher Flavin of Worldwatch Institute and Alden Meyer of the Union of Concerned Scientists; both attended the Netherlands conference as non-governmental observers. I look forward to their testimony.

Senator KERRY. Dr. Bromley?

STATEMENT OF DR. ALLAN BROMLEY, SCIENCE ADVISER TO THE PRESIDENT AND DIRECTOR OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY, ACCOMPANIED BY DR. NANCY MAYNARD, ASSISTANT DIRECTOR FOR THE ENVIRONMENT

Dr. BROMLEY. May I begin by introducing my associate, Dr. Nancy Maynard, who is here with me this morning.

Since I was not aware that we were holding the hearing until we discussed it last evening, I do not have a prepared opening statement. If you wish, I could comment briefly on some aspects of the Netherlands meeting to start the discussion.

Senator KERRY. In a sense, I think Senator Gore and I and Senator Stevens have really framed a large question to you. I would like you, if you would, to make some opening comments that address that larger question in the context of the position taken in The Netherlands. I know we will then want to follow up with some specific questions.

Dr. BROMLEY. Thank you, Mr. Chairman.

Let me begin, then, by simply noting that there is an impression abroad and, to some degree, in this country—and you have alluded to it—that the U.S. and specifically the Bush Administration is dragging its feet and that the President is not interested or committed to addressing the global environment problem with the intensity that it deserves.

It is my position, which I know differs from Senator Gore's and yours, to some degree, that that is in fact not the case for several reasons.

First of all, the global change question is in itself extraordinarily complex and coping with it is going to force adjustments in just about every sector of our economy, every part of our lives, and for that reason it seems to me that it is essential that we not approach these questions either casually or with less than complete care.

The second thing is that, as became evident in The Netherlands, there are a great many countries pressing for commitments for change, for specific quantitative change, in the emission of greenhouse gases that in fact at this time totally lack an understanding of what they are committing themselves to, how they would

achieve those commitments, and what the cost of achieving those commitments might be.

In that sense, I would submit to you gentlemen that a number of the commitments that are being made are, in fact, hollow ones. We in the U.S. have taken the point of view that for any commitment that we make we want to be sure that we can follow through on it. We want to be sure that it will have the effect that we intend it to have. And we want to be sure that we can follow through in an economically reasonable fashion.

It is also important to emphasize that global change involves much more than the greenhouse effect. We have the question of clean air in our cities, acid precipitation—as you, Senator Gore, mentioned—clean water, preserving biodiversity, halting ocean pollution and so on. It is also clear that adding to these problems, by the year 2030, we are going to have an additional five billion humans and many of them in the developing world, most of them actually in urban centers.

I think it is clear to all of us that we, in the industrialized nations, achieved that industrialized status in large measure through the combustion of fossil fuels, so we have contributed a substantial amount of the greenhouse burden in the atmosphere and therefore we do have a real responsibility for taking leadership action in limiting, stabilizing, and eventually reducing that particular loading of the atmosphere.

We are committed to doing just that. At the meeting in The Netherlands we joined with some 66—the number is not quite clear—66 to 70 other nations in a declaration that I think was a major achievement. I was extremely pleased with the results of that meeting.

I must also say, gentlemen, that as you know I was opposed to U.S. participation in that meeting when it was first proposed; the reason was very simple. That meeting, as originally proposed, had as one of its key components the fact that we were establishing an annual series of ministerial meetings that would, in my view at that time, have undercut the U.N. process that we were instrumental in establishing.

It was for that reason that I felt that it perhaps was unwise for us to participate at a high level in the meeting. That worry on my part turned out to have been shared by a large fraction of the participants, and under considerable pressure from other participants—not from us—that whole idea was withdrawn very early in the conference. This became, then, a one-shot meeting of ministers of some 66 to 70 nations.

In that particular framework, I believe that it played an important role because what it did was to focus additional political interest, political enthusiasm and importance on what I would certainly agree with you to be one of the most important problems we face, namely that of addressing the wide spectrum of problems that constitute global change.

As you have said we were leaders in removing quantitative commitments of reduction in greenhouse gases by the year 2000, or 2005. But let me emphasize, if I may, Mr. Chairman, that I think it is unfair to characterize our situation as one of inaction.

We have, first of all, agreed, by the year 2000, to completely eliminate CFCs. CFCs now constitute 25 percent of our greenhouse gas emission. Getting rid of those is, I think, a very important step. And it was important also to notice that at the hotel where the Holland meeting was being held deodorants and other cosmetics were freely on sale in the lobby, all propelled by CFCs. We have taken a leadership role in the matter of CFCs.

It is also true that because 57 percent of greenhouse emission results from the combustion of fossil fuels in the world, our approach right now includes a National Energy Plan, coupled with the Clean Air Act, coupled with the automotive emission control legislation, coupled with an extensive program of research that we have under way—and I should say, sir, that we are spending now on our research and our response to global change more, by an order of magnitude, than any other nation.

We are currently spending something like $500 million a year on those projects, and it is our intention next year to increase that, with your help, to something like $1 billion. We are providing a vast fraction of the understanding that underlies the total global response to these problems, and we ourselves are responding in a substantial fashion.

With respect to the question of committing to reducing carbon dioxide emission, let us say, by 20 percent by the year 2000, it is important to recognize what that would involve. It would involve, for example, increasing the mileage capability of our automobiles by a factor of two. It would involve massive switching away from fossil fuels in our generation of electricity. It would involve massive restructuring of our housing to obtain the kind of energy efficiency that is critical to our reduction of carbon dioxide.

Many people have argued that if we can achieve reductions on a short time scale with CFCs, surely we can do it in an equivalent time scale with CO_2. But I would argue, sir, that there are several substantial differences. The first substantial difference is that in the case of CFCs, through some really outstanding scientific work, it has been possible for us to understand the mechanism—on a molecular basis, molecule-by-molecule—whereby CFC not only catalyzes the reduction of stratospheric ozone but also acts as a greenhouse gas.

Beyond that, the CFC problem was one that, although difficult, was still solvable on a short time scale because replacements for the CFCs were available and new ones are being made available in a way that causes no significant economic disruption to our society. CO_2 is different.

In order to eliminate the CO_2 or reduce its emission substantially, we are going to have to do massive fuel switching, and we have to be careful how we do that. What we really want to do is to switch from coal to fuels that contain more hydrogen and less carbon.

But what few recognize is that in most of the cases where this is being done the minor leakage of methane from the natural gas that occurs in the vicinity of the plant and at the plant itself can, in many cases, because of the much greater methane effectiveness as a greenhouse gas, in fact end up as a net positive contribution to greenhouse warming. You have cut down the CO_2 substantially,

but the relatively small leakage of methane has a bigger effect because, molecule for molecule, the ratio is as high as 22,000 between methane and CO_2.

So we have to be careful about this.

Senator KERRY. Explain to me, so I could follow that completely, what the cause is for the methane leakage.

Dr. BROMLEY. Just simple plumbing, sir. In any plant of this kind there is always a small amount of fuel leakage and normally one pays no attention to it.

Senator KERRY. Is that not simply a demand to start to pay attention to it?

Dr. BROMLEY. It is indeed. But there will always be some degree of leakage, I believe. I was just making that point because I believe that what we have to do is to begin to think seriously again about the nuclear and solar options. They are complementary, in my mind.

The nuclear option will not, in my view, be acceptable in the United States until such time as it is demonstrated to the satisfaction of our public that we have an intrinsically safe reactor design, one that can be made in modular fashion, can be certified once and for all, and can be produced under complete control.

Senator KERRY. Let me understand. Do you mind if I interrupt you with a question?

Dr. BROMLEY. Please do.

Senator KERRY. You are not suggesting, I take it, that the nuclear option is now being held out as one of two alternatives by the Administration for global warming?

Dr. BROMLEY. No.

Senator KERRY. You are simply talking about future energy production?

Dr. BROMLEY. I am talking about future energy production techniques, sir, that will reduce CO_2 in a major way, and there are really only two that will give you large amounts of electricity.

Senator KERRY. I understand. But I think it is a mistake to talk about nuclear power as a CO_2 reduction method in the context of global warming, is it not? Because you are really talking about a second generation nuclear plant that is conceivably 20 or maybe 30 years down the road.

Dr. BROMLEY. There we would differ, sir. I believe that if we were to move aggressively on this that we could have the design demonstrated and prototypes testing within five years and have these in use extensively in 10. It can be done. It is a question of whether the public is prepared to have it done.

Senator KERRY. Well, again, this is the first time I have heard the Administration, I think, set this out as a matter of policy. It is certainly one of the first times that I have heard nuclear power being offered realistically as a part of the actions to address global warming mix.

Most people have viewed this matter with such urgency that available alternative fuels and energy conservation have been viewed as the major——

Dr. BROMLEY. I agree with you completely, sir. What I am trying to do is to sketch out a long range plan, and I will come back and talk about the immediate one. But I will drop that point, then.

Senator KERRY. No, no. I just wanted to get it in its proper context.

Dr. BROMLEY. It is not being proposed—let me emphasize that. I am not proposing this as any immediate response to the CO_2 problem. In fact, the same is true for solar energy. Solar is fundamentally a niche energy source, as far as I am concerned. I do not look to it to provide large blocks of electrical energy, but it can be very important if we develop ingenious ways of using it in modern architecture, building retrofits, household warming, hot water supplies and so on.

You quite correctly, sir, mention the most important thing that we can do right now, and that is aggressive energy conservation. As I said, 57 percent of our greenhouse emissions are related to the burning of fossil fuels, and we can make substantial improvement in the mileage of our automobiles, trucks, other transport. We can, I think, make even more impressive gains in energy—and each gain in energy is reflected in a reduction in greenhouse gas emission—in industry. I would emphasize, sir, that we are unique in the developed world in that almost every one of the industrial processes that have been developed in this country over the years was developed with energy missing from the governing equation.

In Europe and elsewhere, energy costs were always figured into the equation and when the equation was differentiated to obtain an appropriate balance of the various cost parameters, energy played an important role. In the U.S., in distinction, the assumption was typically made that energy was always going to be available and cheap and that it was not important.

On that basis we made some very important decisions. For example, our aluminum in this country—and the aluminum industry is one of the most energy-intensive that we have—made the decision to go with a fluoride process to extract metallic aluminum. Had it decided to go instead for a chloride process, we would have saved 30 percent or more of the energy required.

Why don't we change immediately? Well, obviously because we have huge capital investments in the plants involved and it is going to take us some time. But the trend is already beginning and industry after industry is making these changes.

We are going to have to go to gas turbines that are extraordinarily effective, and by using co-generation techniques, Senator, as you well know, we can increase our efficiency—in terms of extracting energy from the primary fuel—from something like 30 percent to something in the neighborhood of 60 percent. That is a massive improvement.

Senator KERRY. Let me say, if I can, I do not think you and I are going to find disagreement about the capacity of new technology to move us into an age of energy conservation. I am not sure that is the debate here today.

What I really want to focus on is the rationale underlying the Administration's position with respect to the Netherlands conference. It was the first great opportunity, in a sense, for us to offer the worldwide leadership that the President had promised.

Now, you talked about the perception that is abroad with respect to the Administration's position. So that there is no question about why that perception is there, let me share with you some of the

news headlines, while you were gone. Maybe you have seen your own clippings—but this is from the Washington Post during that period of time.

The headline: U.S. Moves To Block Pact On Emissions. "Representatives of the United States today sought to block efforts at an international conference here to commit the world's industrial nations to cutting back their carbon dioxide emissions in an attempt to counter global warming. The Administration is not ready to commit itself to specific target levels and dates for reduction until it has done more research." And then the story goes on.

Now environmental groups, the vast majority of the 72 nations there, all sought a reduction. We joined with Japan and five other nations in pulling that conference back from that commitment. So the questions on the table are the obvious ones: Why? Why is the United States not offering that leadership that we promised? Why are we holding people back, these 67 other nations, from doing what they want to do?

Dr. BROMLEY. Let me answer that, sir, in two parts. First, the question of the number of countries that were opposed to the specific targets for reduction. One of the key features of the Netherlands conference, as distinct, for example, from the Vienna conference that led through the Montreal Protocols to the CFC reduction, was that in The Netherlands there was, by design, an attempt to separate the industrialized from the non-industrialized world.

No requirements were placed on any of the non-industrialized countries. Had there been a requirement that, as is the case in the Vienna and the Montreal Protocols, for a two-tier system, for example, with appropriate requirements on both the industrialized and non-industrialized countries, we would have had the support of a very large fraction of the Third World—China, Brazil, India—and in fact we would have represented collectively a very large fraction of the world's population.

The fact that they were not listed as supporting our view was simply because they had been removed from any requirement at all. Had the requirement remained, they would have been clearly with us on this.

The second part of the answer is that I would argue with you, sir, if I might, that taking the position we did was not evidence of lack of leadership. I would argue, on the contrary, sir, that it was in fact the highest form of leadership, because I do not believe, nor did any of my colleagues, including Bill Reilly, that many of those who were voting for the specific targeted reductions had any idea how they would achieve those reductions or at what cost.

What we were saying, and what we said repeatedly, was that we were committed in the period between now and November of 1990 to doing what was required so that we could come up at that time, at the Second World Climate Conference, with the kind of information that I hope would make it possible for us to come forward and say that we could reduce CO_2 emission.

But we were not prepared to say that in the state of ignorance that existed when we were in The Netherlands. And let me emphasize, sir, that next February—February 1990—here in Washington we will have a meeting of the three working groups that are func-

tioning under the United Nations Environmental Program—one chaired by the British, one by the Soviets, and one by us.

That set of working groups will report to the full IPCC in midsummer of 1990, and the final reports of that group will be available to the Second World Climate Conference in Geneva in November of 1990.

Our goal here in the United States is that in parallel with those processes and working with them, we want to do three things. The Administration is committed to these things.

First of all, we want to bring in representative groups of the very best scientific talent we can find in the United States to talk with us about the whole underlying understanding of these matters. We want to bring in representatives of all the major environmental groups to get their viewpoint. And we want to bring those two groups together so that we can get the best possible input on these matters, viewed from people who have been engaged in them over periods of years.

Second, we have a group set up now under the Council of Economic Advisors that is actively working to try and quantify the economic impact of stabilization of greenhouse emissions, and of possible reduction of greenhouse emissions.

Third, we have in this country something that is quite unique in the world, and that is a private sector that, just as government over the last several decades, has led the world in terms of its attempt to understand and respond to global change, so also have our private sector industries, within their own structures, experts in these fields. They have enormous amounts of experience and data, and I have charged—under the Domestic Policy Council Working Group—the Department of the Interior with pulling together the best cross section we can find of information and input from the private sector.

What we want to do with all of this, sir, is to have available by November of 1990, when we get to this Second World Climate Convention, the kind of information that we hope will be sufficient to allow us to move forward, because we recognize, with you, that this whole question of global change is, first of all, extremely important. Second, it is fundamentally international. And, thirdly, we definitely aspire to continuing the leadership role that the U.S. has held, and rightly so, in my opinion, for decades.

Senator KERRY. I appreciate the detail of that answer, and I appreciate having the goals and the specific sort of strategy.

I am not trying to belabor a point or beat a dead horse, but the question that immediately leaps at me and other people is, while it is good to see that happening, it is hard to see how that keeps pace with the promise made more than a year ago when the President committed to having a conference this year.

I mean, that was the time to pull all those people together—all the environmental groups, all the scientists, the Council of Economic Advisors. The President made a pledge that such a conference would occur at the White House in 1990.

Dr. BROMLEY. Sir, I can only comment that I have only been here since August of 1989, and I am afraid I cannot comment on what happened prior to that.

Senator KERRY. Well, notwithstanding that, you say we are really in a state of ignorance. Are we really in such a state of ignorance?

Dr. BROMLEY. I would say so in terms, sir, of what it would take to achieve, (a), stabilization, (b), reduction in carbon dioxide emissions by the year 2000. I do not believe that we know how we would do it and what impact it would have on our economy. I think that it is important for us to know both of those things, and I think we will find out and can know them within the year.

Senator KERRY. Let me ask you this. What are the possible options for how you would do it? One is certainly the CAFE standards, is it not?

Dr. BROMLEY. Yes, but that is not going to have a major impact.

Senator KERRY. I am just trying to get at them. Why don't you lay the options on the table for us?

Dr. BROMLEY. The first option and most important in terms of our reduction of greenhouse emissions is clearly the CFC reduction, because that is a clean 25 percent of our total right now.

Senator KERRY. Now are you content with the year 2000 for a 50 percent reduction?

Dr. BROMLEY. No. I want it completely gone.

Senator KERRY. 100 percent?

Dr. BROMLEY. 100 percent.

Senator KERRY. Many of us have suggested by 1995. Do you believe that would be a better goal?

Dr. BROMLEY. I do believe that would be a better goal if it could be done without undue economic cost. So there is no question the sooner we get rid of the CFCs, the better.

Senator KERRY. Are you going to push for the concept of speeding up that goal?

Dr. BROMLEY. It is clearly one of the things we will be considering.

Senator KERRY. Next is what?

Dr. BROMLEY. The next point is energy conservation, and the reason there is simply because so large a fraction of the remaining greenhouse emissions are related to the burning of fossil fuels. We cannot, in my view, switch fuels effectively quickly, and therefore conservation is our answer.

Conservation then goes to the points you just mentioned. Under the general rubric of conservation is greater use of co-generation, more effective use of insulation, the change in the mileage requirements for our automobiles, the full Clean Air Act legislation, although in fact it bears noting that there is a large body of scientific information that suggests that the sulfur oxides that we are committed to removing by the clean air legislation act to cool the earth.

It does raise a question. I do not think anyone will argue that we should not do it, but we are going to take 10 million tons of SO_2 out of the air and that in itself is going to contribute to warming.

But energy conservation is clearly one of, and the dominant one, I think—after emission CFC reduction—in terms of a coherent program.

Then, farther downstream, sir, to complete this and to follow through, I think we could perhaps stabilize. We could look forward,

hopefully and while I cannot guarantee this as yet, to certainly stabilizing greenhouse emissions with just those two approaches, but to go beyond that and start reducing the emissions——

Senator KERRY. Well, they are growing at three to four percent per year now, correct?

Dr. BROMLEY. Carbon dioxide is growing at 0.4 percent per year.

Senator KERRY. But the carbon dioxide, I understood, was rising at three to four percent per year.

Dr. BROMLEY. The world CO_2 is rising at 0.4.

Senator KERRY. In the United States?

Dr. BROMLEY. Our emissions?

Senator KERRY. Correct.

Dr. BROMLEY. Our emissions I think may be rising at the higher rate. The world emission increase is 0.4 percent.

Senator KERRY. Well, are we satisfied with the concept of waiting this period of time for a three or four percent increase per year for our own emissions?

Dr. BROMLEY. Not at all. I said that we could hopefully stabilize using the simple energy conservation measures—not simple but perhaps straightforward ones that I have just mentioned. To go beyond that we have to begin fuel switching.

Fuel switching will take longer but will be extremely effective, particularly if we can switch to nuclear and solar techniques, because both of those, for obvious reasons, do not contribute, at least directly, to greenhouse gases emission.

Senator KERRY. Now are you making any specific recommendations for the Administration and a commitment of resources in order to improve energy efficiency?

Dr. BROMLEY. The Department of Energy has part of its program in the new budget that is specifically directed toward energy conservation and another part specifically directed toward pulling together the National Energy Plan, which focuses in large measure on conservation. So yes, the Administration is funding activity on this.

Senator KERRY. What other considerations are on the table as options with respect to the choices you are going to make?

Dr. BROMLEY. One, of course, is the whole question of afforestation because to the extent that you can have a larger number of younger growing trees, you have a net sink of carbon dioxide and you have the ancillary advantages that in some areas you can, of course, prevent erosion and in others you can provide biomass.

I always find it a very disturbing statistic that in India the average family has one or two members spending typically some five to seven hours a day searching simply for biomass for fuel. We can do a lot with afforestation, and we are actively involved in this at the moment.

I was just involved in a budget review yesterday where we are prepared to commit several hundred million dollars specifically to tree planting programs in our own country.

Senator KERRY. Let me just ask you something. You do not for an instant believe—I want to try to get to the nub of this, if we can—you do not believe that reforestation is going to solve the problem.

Dr. BROMLEY. Not at all. It is one component.

Senator KERRY. And you do not believe that fuel switching is going to solve the problem, is it?

Dr. BROMLEY. Total fuel switching would go a long way toward solving the problem.

Senator KERRY. In what period of time?

Dr. BROMLEY. Twenty years.

Senator KERRY. Over 20 years.

Dr. BROMLEY. In our country, sir?

Senator KERRY. In our country.

Dr. BROMLEY. We have to be extraordinarily careful to recognize that the Third World, in its quite natural drive toward industrialization, has little option but to use fossil fuels, and so supposing that we were to cut our emissions to zero essentially overnight, we would have a relatively small effect on the global situation.

We have to, in addition to the work we do within our own borders, I think, aggressive in responding to the real need that the Third World has for the technology and, indeed, the funding that will make it possible for them to achieve industrialization with minimal impact on the environment.

Senator KERRY. I agree with that. I think that is a very, very significant issue, but it is obviously going to take a massive infusion of technology and expenditure in this country to assist them in the development of those means. We are not doing that.

Right now we have a DOE that is essentially saying well, we need a lot more study, and they are not committed to the development of that kind of technology; they are committed to more study as to whether or not we need to do this.

Dr. BROMLEY. That is not quite fair, sir. The National Labs, the Department of Energy National Laboratories at Oak Ridge, at Argonne, to name two that I know very well, in fact have rather extensive work specifically on the development of technologies for this purpose.

I admit that we have a problem in getting that technology not only to the Third World but into our own industrial sector.

Senator KERRY. Have you ever met with Amory Lovins?

Dr. BROMLEY. In the distant past, year.

Senator KERRY. Are you familiar with the work that the Rocky Mountain Institute has done on energy conservation?

Dr. BROMLEY. Not in detail.

Senator KERRY. He was in my office recently with a little black suitcase that had current technology in it, current light bulbs, various energy-saving ingredients, and in that one black suitcase is the ability for the United States to supplant several nuclear plants of power.

Dr. BROMLEY. There is no question about that, sir.

Senator KERRY. Why are we not pursuing that as a matter of urgency in the country? I mean, there is no sense of urgency. I have got to tell you, there is just no sense. It is now November. Almost one-quarter of this Administration's time in office is now gone. And everybody is reaching.

Dr. BROMLEY. I sense some of your frustration, Senator, and I share some of it. The fact is, however, that we do have—as you mentioned—the small satchel-sized things. For example, we have now available in this country on market shelves fluorescent light

units that with 11 watts of electrical input will produce the same light output in color, quality, not totally indistinguishable from a 60-watt incandescent bulb.

It is, however, more expensive than the 60-watt bulb.

Senator KERRY. On the other hand, if the government were to educate people, they would realize that they would save themselves a considerable amount of money on their electricity bills for the original outlay.

Dr. BROMLEY. Those educational programs, I regret, sir, as much as you do, have been slow in coming. But they are coming, and the Department of Energy is committed to getting rather massive programs of that sort under way during this coming year. Secretary Watkins shares our feeling that this is a very important part of his job.

Senator KERRY. Are there any other options that you will have on the table besides the CFC reduction, the energy conservation, the fuel switching and the reforestation?

Dr. BROMLEY. Yes. One of the important ones that we can not tackle by ourselves, but one that is very important for not only greenhouse reasons but for a number of others is to work with our colleagues abroad, particularly in Brazil, where the world's largest tropical forest still remains.

At the present rate of destruction of that forest, the people that I know who have been working down there estimate that in between 15 and 20 years the forest will be gone. That would be a world tragedy not only because this forest acts as probably the most massive global sink for CO_2 that exists other than the oceans but also it is the largest reservoir of new species, a gene pool that is the heritage of all mankind, and that will simply be destroyed before something like 80 percent of it has ever been characterized, if we proceed the way we are going.

We must evolve methods of working, cooperatively, with our Brazilian colleagues to do everything we can to minimize that. There have been many suggestions--debt for nature swaps and many others. All need to be explored.

Senator KERRY. Does the Administration therefore now support the Tongass forest restrictions in an effort to try to set an example with respect to rain forest management?

Dr. BROMLEY. That is now under immediate discussion.

Senator KERRY. Well, I would certainly hope that it would and hope you would so recommend.

Dr. Bromley, you were asked by the President to go as the White House representative. Was Mike Deland also asked to go?

Dr. BROMLEY. I do not believe so, sir.

Senator KERRY. Was he considered?

Dr. BROMLEY. I do not know.

Senator KERRY. Do you have any sense of whether Mike Deland not attending the conference indicates that the President and the White House view this as a scientific issue rather than as an environmental question.

Dr. BROMLEY. I would not draw that conclusion, sir, because, after all, Bill Reilly, the Administrator of EPA, who was former president of the World Wildlife Fund, was leader of our delegation.

Senator KERRY. I understand that, but there are many who felt that you really went as Bill Reilly's watchdog.

Dr. BROMLEY. Let me assure you that that was not the case; that Reilly and I had a completely collegial approach to this meeting. We jointly attended a great many sessions with other delegations. It was extremely important for both of us to form personal connections and to get to know these people and their feelings, in some 20, I guess, countries. And at no time during the entire session, let me assure you, was there any disagreement whatsoever between Bill Reilly and myself.

Senator KERRY. Well, I appreciate that.

The press statement which was released by the White House after the conference indicated that the United States joined, obviously, in support of the Noordwijk declaration. Does that indicate that you and members of our delegation were active in drafting the provisions of that declaration?

Dr. BROMLEY. I should perhaps back off, Senator, and just explain briefly how this declaration was developed. In the week prior to the ministerial meeting, senior officials from all of the participating countries, with minor exceptions, gathered in Noordwijk to work on a draft that had been prepared by Minister Nijpels and his colleagues in Holland.

This draft then, having been very largely worked over by representatives from most of the countries participating, was available at the beginning of the ministerial meeting that occurred on Monday and Tuesday of last week.

Senator KERRY. Had it been worked over by us at that point?

Dr. BROMLEY. Yes, indeed, it had. And we had had a significant group of representatives in Noordwijk who had been very active in the discussions and negotiations on language and content.

During the actual ministerial meeting—a little surprising perhaps—there was no discussion of the actual declaration on the floor of the conference prior to the last half hour. The remainder of the conference was taken up with statements by the representatives of some 70 countries, and although they were all supposed to have two minutes I think you will understand that it is very difficult for a minister to speak for two minutes and so this went on.

At the end, instead of having a discussion of the declaration, or any negotiation or anything of that sort, the chairman, Minister Nijpels of The Netherlands, read the paragraphs which had occasioned most discussion in the working groups that had been involved for the prior week and through the course of the conference, and said, "This is the language that we seem to have agreed on. Are you agreed on this?"

And without opposition, except for some rather minor opposition which was ruled out of order on various grounds, the declaration was then taken to be accepted as distributed and immediately following that a press conference was held at which most of the major industrialized countries were represented. Bill Reilly represented us at that news conference.

Senator KERRY. At what point did we have our input to the drafting of this?

Dr. BROMLEY. Primarily during the week prior to the conference.

Senator KERRY. One week prior to the conference, the President had not even decided to send anybody.

Dr. BROMLEY. Oh, yes.

Senator KERRY. Was it not only in the last days that the President——

Dr. BROMLEY. No. It was more than a week before that our delegation was assembled. I should also say, Senator, it was not just during that week but during the entire course of the meeting itself. Few of us got much sleep because the negotiations on various aspects of the declaration continued from early morning until early morning; this was a dynamic document that was being changed right up until minutes before the Chairman began reading the final version to which all countries found it possible to agree.

Senator KERRY. Are you in agreement with the provisions of that declaration personally?

Dr. BROMLEY. Yes, sir.

Senator KERRY. Why do you believe that it is safe for the United States, simply given our own prospective costs in the future, to not take action now in terms of reduction rather than stabilization? I mean, if we are going to agree to continue with this three to four percent while we go on, are the costs not in fact almost certainly going to be higher?

Dr. BROMLEY. I have no question, sir, that I believe we are not only going to stabilize but eventually reduce. The question is when and how. And my point and, I believe, the point shared by all the members of our delegation and by the Administration is simply that we have the period between now and next November in which to try to understand more fully than we do now what we are best able to do to achieve the goals that I think we share.

Senator KERRY. Now you have been named to head the working group of that Domestic Policy Council that is going to carry out this assessment, correct?

Dr. BROMLEY. That is correct.

Senator KERRY. Is the timetable that you gave me earlier—the meeting in February and then the November report—is that the full timetable for that program?

Dr. BROMLEY. Yes. The IPCC process finishes.

Senator KERRY. That will be the process?

Dr. BROMLEY. That is right.

Senator KERRY. Nothing outside of that?

Dr. BROMLEY. Well, of course there will be a great deal outside of that in the individual countries, but, for example, there is not to be a repeat of the Noordwijk conference as had initially been proposed.

Senator KERRY. Do I understand that the Administration is now poised to call in all the heads of our environmental groups in this country? You mentioned that as one of the four——

Dr. BROMLEY. Not all, but a good, representative cross section. I would not even know how to get all.

Senator KERRY. Of the major environmental groups dealing with this issue.

Dr. BROMLEY. That is correct.

Senator KERRY. And, in addition, you are going to meet with the representatives of the scientific community?

Dr. BROMLEY. That is correct.

Senator KERRY. You have been dealing with this?

Dr. BROMLEY. Yes.

Senator KERRY. Does that mean the strongest proponents?

Dr. BROMLEY. No. We would like to get a mix. In each of these areas we would like to get as broad a spectrum of opinion as we can.

Senator KERRY. I understand that, and I have no doubt that you have found people to listen to who say slow down. My question is, are you going to bring in the folks who are the strongest advocates of the view that we ought to be proceeding forward?

Dr. BROMLEY. I have not found too many leaders of the environmental groups that are urging us to slow down, sir.

Senator KERRY. Well, maybe it is the business groups, then, or the economic analysts that have made the suggestion.

Dr. BROMLEY. We are bringing them in as well, sir, from the private sector.

Senator KERRY. Now I query whether or not the President has been briefed on this by scientists.

Dr. BROMLEY. The President has been briefed on this by me, and I consider myself a scientist. He has also been briefed in detail by John Sununu, who considers himself a very competent engineer. At this point we have not arranged for major briefings, but we certainly intend that this will happen in the not too distant future.

I should also tell you, sir, that with the President's strong support I am in the process of exploring the bringing together of a meeting early next year of the science ministers of the G–7 countries to try to put together an international program that would be, if you like, parallel to our national program for understanding and addressing global change phenomena. The President is very much interested in this, has been extremely supportive and the President will certainly have an opportunity to meet with a broad cross section of people.

Senator KERRY. The United States Senate, thanks to Senator Gore and Senator Wirth and others, had a major briefing by scientists on this issue. It was absolutely fascinating. There were things that we heard and learned and were able to ask questions about that gave us insights that we did not share before.

Margaret Thatcher has done this. Helmut Kohl has done this. Prime Minister Hawke has done this. Clearly other leaders have said: "Something is going on and I want to understand the science better." Why is it that the President, who again said: "You have not seen anything about the greenhouse effect until you have seen the White House effect,"—why has he not brought in these folks for an hour or two just to get a sense of it?

Dr. BROMLEY. I believe that he certainly intends to do that. But in the meantime I would like to believe that he trusts his science advisor.

Senator KERRY. I have had a lot of questions and Senator Gore has just returned. I know he has a number he wants to ask, so let me just turn it over to him.

Senator GORE. Thank you very much, Mr. Chairman.

Dr. Bromley, you said in your opening comments that the nations voting for targeted reductions were not aware, indeed had no idea of what they were committing themselves to.

Dr. BROMLEY. For many of them I believe that to be true.

Senator GORE. And that the U.S. exerted leadership in reining those countries in. I know you have a meeting downtown, so I will respect that.

Does the United States know what we are committing ourselves to by a policy of inaction?

Dr. BROMLEY. We are in the course right at the moment, sir, of trying to get a detailed examination of the impacts, the costs of various actions, the costs of inaction, to get a full economic picture of where we are, yes. We do not know the answer right now, but we will know the answer within a matter of months.

Senator GORE. We will know the answer in a matter of months?

Dr. BROMLEY. We will know the answer. I would never say we will have a complete answer.

Senator GORE. What will we know in a matter of months that we do not know now?

Dr. BROMLEY. I believe that we will know enough to allow us to be able in the Second World Climate Convention next November to say, I hope, that, a, we can stabilize and we are happy to commit to this because we know how we are going to do it, we know what it will cost. And, depending on what we find out between now and then, my personal hope would be that we could begin to think about committing to some reduction.

But at the moment, as far as I am concerned, we simply do not know enough about how we would do it and what it would cost to make that commitment in a meaningful fashion.

Senator GORE. Do you believe that there is significant uncertainty about the relationship between large increases in CO_2 levels and increasing temperatures?

Dr. BROMLEY. No. There is some question in some people's minds about cause and effect, but I think as far as I am concerned it is clear that the two are closely correlated.

What concerns me is the distinction between long and short-term effects. In the long term, I have no question but what if we keep dumping greenhouse gases into the atmosphere the temperature will rise. But what we are calculating in all of these cases are equilibrium states. How we get from one of the equilibrium states to the other, however, is not at all clear to me or to any of the people I know in the field. It is clearly not going to be a linear path from one of those equilibrium points to the other, and we could get considerable fluctuation on the way.

My point is simply that in the period between now and next November we are not going to have any dramatic greenhouse-induced changes and so I am prepared—and I recognize, sir, that we disagree on this—but I am prepared to wait for that period because I believe that we will have the information at that time to make a much better choice and to develop much better policies to achieve the ends that we both want.

Senator KERRY. Can I just insert one quick question there?

Senator GORE. Sure.

Senator KERRY. Why, if that is so, would it not have been—I mean, you have acknowledged the linkage of the two. I know you believe that warming will take place, and that we are going to have to reduce emissions by some means. Why would it not have been as simple to commit yourself to the reduction and lay out the timetable for finding out how you are going to do it?

Dr. BROMLEY. We, as distinct from many of the people at that conference, sir, believe that we should really stand by what we committed to. Let me tell you, we were told by the head of one of the other major delegations, that, "Look, it does not matter; they cannot take you to the World Court at The Hague if you do not achieve this."

Our delegation took the point that we meant what we were saying, and we were not in a position to agree, because we did not know how we would in fact achieve the reductions that were being discussed or what the impact would be. We felt that it was essential for us, if we were going to be leaders in the world community to know these things.

This is an uncertainty that is shared by a great many countries, some of whom committed to it; others did not. We felt then, and I feel now, that we are in fact exercising important leadership by really examining these questions in this period where we have committed ourselves to going with the United Nations program, which will terminate next November, and to having the best possible information that we can have to be able to make the best possible policies by late 1990.

We felt that we were not ready at the time of the Dutch conference. We did not understand really how we would achieve specific goals by a specific timetable. I am convinced that by November of next year we will be in a position to say what we can do, when.

Senator KERRY. Thank you, Senator.

Senator GORE. Are you familiar with the report coming out from the mathematicians at Bell Labs analyzing the causal relationship between CO_2 and temperature changes?

Dr. BROMLEY. No, I am not, sir.

Senator GORE. They are going to present their study at a meeting of the American Geophysical Union next month.

Dr. BROMLEY. May I ask who the people are, sir?

Senator GORE. I do not have the names; they are mathematicians from AT&T's Bell Labs. They have done statistical analyses of the data on CO_2 and temperature.

They have essentially ruled out other explanations and concluded mathematically that there is a 99.99 percent chance that the warming and the CO_2 rise are causally related. What is your reaction to that?

Dr. BROMLEY. I really never doubted it. But which was the driving force is still open.

Senator GORE. All right. Now if you have the two moving exactly in tandem, CO_2 concentrations and temperatures, if they move exactly in tandem up and down in identical patterns for 160,000 years, and then in the space of 30 years one of the variables, CO_2 concentrations, suddenly jumped to a level twice as high as has ever been recorded, what chance is there that the second variable,

which has up until that point moved in tandem, will suddenly move at right angles to the CO_2 data?

In other words, they go up and down together for 160,000 years. The CO_2 concentration jumps up. What is the likelihood of the temperature remaining level?

Dr. BROMLEY. We have no disagreement on that, Senator.

Senator GORE. Well, we do, though.

Dr. BROMLEY. No. The point is that for the 160,000 years we are talking about in the ice core record it was a pure, undisturbed, natural phenomenon, and the question of their correlation is without doubt. Everyone will agree that they are completely correlated.

What we have done is to perturb that system since about 1850 by dumping additional CO_2 into the atmosphere. The question in the past has been, did the CO_2 drive the temperature, or did the temperature drive the CO_2? And that is not an answered question.

Senator GORE. Or both?

Dr. BROMLEY. Or both. That is not a fully answered question yet. My point is that, as I said to Senator Kerry before, I have no doubt whatsoever that as we continue to dump CO_2 into the atmosphere that the temperature will rise.

How we get from one equilibrium state to the other is not as well know and will very probably in this complex atmospheric environment not be a linear system. We will have oscillations and fluctuations along the way.

But we have no disagreement, Senator, at all that over the longer period it is clear that the temperature will rise if we keep doing this, and that is why I say—and I am happy with this declaration—we have got to stabilize as soon as possible and we have got to reduce as much as we can, consistent with the other constraints on what we are doing, our economy, other things that we have to take into consideration.

So I am in agreement with you on all that. It is purely a question of when do we start, and I am saying that nothing is going to happen fast enough to convince me that we have to do something dramatic before next November, when I think we will be in a much better position to take coherent action involving the whole world. That is the key point.

This is a U.N. program we are working in.

Senator GORE. But what you are waiting for really is not any further evidence to convince you we are creating an environmental catastrophe, correct? You have enough evidence now to conclude that our current course of action will cause an environmental catastrophe worldwide, correct?

Dr. BROMLEY. If we continued and just went on as we are doing now, doing nothing, yes, eventually we would have a totally unacceptable situation. I agree with you.

Senator GORE. So the additional evidence you are seeking is not really environmental. You are seeking additional evidence on what the political discomfort of the economic adjustments will be, correct?

Dr. BROMLEY. I am not so sure I would say the political discomforts. I would say what the cost to our taxpayer and what the cost to the quality of their lives would be.

Senator GORE. Okay. You are satisfied that an unprecedented environmental catastrophe is in the making.

Dr. BROMLEY. Eventually.

Senator GORE. But the discomfort associated with the response requires more analysis?

Dr. BROMLEY. That is correct.

Senator GORE. I think that is a completely unacceptable position. We are seeing the consequences of environmental catastrophe today. 37,000 children under the age of five die of starvation and preventable diseases every 24 hours in the world. Environmental causes are prominent among the many causes of that catastrophe.

We saw an influx of refugees from Haiti to the United States not only because of Duvalier's political system but because of the consequences of the island being deforested and its environment being ruined. We are seeing the accumulation of poisons in our atmosphere, our oceans. We are seeing the loss of topsoil. We are seeing the disappearance of species at a rate 1,000 times greater than at any time in the recorded record for the last 65 million years.

And you are concerned about the discomfort of responding to this problem. When Neville Chamberlain went to Europe on the eve of World War II, the pattern of Nazism was already clear. Perhaps, he said, if we give them Czechoslovakia, if we wait and see whether or not Hitler will be satisfied, nothing more will be needed. We can adapt to it. Let us wait.

Krystalnacht had already occurred. The spread of Nazism had already begun. We were afraid in the west to confront it. And many stuck their heads in the sand and said this may go away.

I think that in many ways we face an analogous situation. There is an environmental holocaust under way. We are in the early stages. The crisis is building rapidly. And this Administration is advised by a distinguished scientist who has just told this Committee that no more scientific evidence is needed to conclude that this present pattern will in fact produce an unprecedented environmental catastrophe, but more evidence is needed to assess the pain of responding to this pattern and changing this pattern.

Let me say that when Chamberlain made his trip it was already apparent to Winston Churchill and others that the only adequate response would be something approaching the scale and horror and difficulty of World War II. It is already apparent to many that the response by global civilization to this crisis is going to be of unprecedented difficulty, causing tremendous changes throughout our civilization.

We need—and I will conclude with this and let you respond—leadership. We do not need vacillation. We need boldness. We do not need timidity. We need foresight. We do not need the kind of myopia that says the economic policies may be uncomfortable.

You know, this Administration faces problems by looking at overnight tracking polls and looking at the approval rating when the numbers come in the next morning. You know what I think the White House is really concerned about? I think they believe that in times of peace the level of economic activity on election day is the principal determining factor in deciding whether an incumbent president will be reelected or not.

And I think this White House is scared that if it faces up to this environmental catastrophe, a set of forces will be unleashed throughout the world. These forces may cause uncomfortable adjustments here in the United States in a way that could dampen economic activity prior to the election in November of 1992.

I think they are approaching it with just that degree of cynicism. And I know you well enough, Dr. Bromley, to believe there is a chance that on the issue of the global environment you may yet be capable of playing the kind of role that G. Everett Koop played on public health policy. I believe you are a man of integrity. I believe you are a man of intellectual ability. I believe you are a man who knows what courage is all about. And I believe there is a chance you will change your mind about the significance of the evidence now laid out so clearly before the peoples of this world.

You, sir, have an opportunity to be the fulcrum of change, and I hope you will do it.

Dr. BROMLEY. Senator, two points. Let me first of all correct, if I may, one impression. That is, I at no point wish to be understood as saying that we do not need additional scientific information. What I said was that in the long term I have no question whatever about the fact that if we continue to load our atmosphere with greenhouse gases we will eventually have an intolerable and unacceptable situation.

I would also, sir, suggest to you that that situation however should not fairly be compared with the Nazi holocaust.

Senator GORE. I believe that those who view the Holocaust as only a Nazi phenomenon are still engaging in a more sophisticated form of the denial process which prevented an earlier recognition by the world of what was occurring in the Germany of the 1930s and 1940s.

Even after the strategic bombing surveys gave us aerial photographs of the death camps, many disputed the meaning of that evidence. Even now, some believe it was only a German phenomenon, only a Nazi phenomenon. I believe it was a phenomenon generated by forces deep in the human soul, and I believe that the reemergence of anti-semitism in the world gives further evidence to how deep these forces run.

I believe that the forces causing this collision between industrial civilization and the ecological system of the earth are also very deep in the human soul. The number of deaths caused by rapid environmental degradation easily approach the number of lives lost in the Holocaust. If the process is allowed to continue, the number will far exceed those lost in World War II.

In order to confront this crisis, we must confront the problem of denial. We must confront the forces that have generated the crisis. I believe that the scientific debate is only the beginning of the debate which must now take place.

But the larger debate will not really begin in earnest at the level of political decisionmaking until those who provide the scientific advice stop playing games with the degree of certainty where the overall pattern is concerned. There is a collision. It is under way. It is violent. It is degrading the environment of the entire earth in ways that will have cataclysmic effects on human civilization.

And if we deny that that is taking place, we are kidding ourselves.

In any event, you have another meeting and I look forward to continuing this dialogue for quite some time, and I look forward to both of us learning in the process, and I hope that you will change and play the kind of role that Dr. Koop played.

Dr. BROMLEY. Thank you, Mr. Chairman.

Senator KERRY. Do you have any comment?

Dr. BROMLEY. No, Mr. Chairman.

Senator KERRY. Well, Doctor, I want to thank you for coming up here. I think it has been helpful in giving us your analysis of the Netherlands meeting, as well as understanding the rationale for the position you have taken. Whether or not we agree or disagree about it, at least it is on the table and you have answered your critics with respect to that particular meeting.

I am also pleased that you have set out your timetable, again whether we agree or disagree that it is appropriate enough or timely enough. It is a timetable, and we have a sense of what your plans are now and where you are going. And that has been helpful.

Senator Gore, other Senators and I, obviously share a sense of frustration at the same time, I really want to underscore that I agree strongly with the essence of what Senator Gore has just said. I think that there really is a worldwide collision course that we are all on, and the issues are linked.

Third World debt is not just Third World debt. And those countries are unable to engage in activities that permit them to choose economic means of survival other than continuing on that collision course. As long as our economic adjustment policies under the IMF and the World Bank push them into an export posture, using products and means of producing those products which continue on that course, nothing will change.

It seems to me that with the transition in Eastern Europe, President Bush is sitting on the threshold of an important moment in history. He and President Gorbachev, as well as, Japan and others who are more dependent on those two leaders, could really begin to confront these choices.

The technology of DARPA, Livermore Labs, Lincoln, Draper Labs, all of these places could begin to be harnessed to develop technologically supportable and economically efficient means of production that move us in new directions.

I think for a lot of us there is a sense of dija vu. I have lived the acid rain issue for years now. I was chairman of a Governor's task force as a lieutenant governor, traveled to Europe and listened to all the scientists, five and six and seven years ago. I also watched every company in Germany, without tax credit, without subsidy, without any government break, capitalize on their own to retrofit scrubbers because they saw their natural heritage going down the drain.

They made that decision. Meanwhile, we studied the issue, even while Canada said do something and so forth. I see a total repetition right now, and I could not echo more the plea of Senator Gore and of others here. You are an advisor, and as an advisor I think you have an opportunity to help set this nation on a new course

with respect to to how we behave in the world and to what our responsibilities are.

On the moral issue, there has to be linkage of the morality that people pursued in the course of World War II and our morality now with respect to earth and the choices we ought to be making for future generations. I do not want to be part of the first generation in the history of this country to pass it on to the next in worse condition than we found it. But I will tell you right now that is the course we are on.

So again we did not bring you up here to lecture you, but I think it is an interesting dialogue. My hope is that we can join forces to offer the kind of leadership that I think the world wants and that we obviously need.

Just yesterday on the Poland bill, I had some amendments put in with respect to the environment in Poland and our development policies. Only one percent of their drinking water is potable today, and a quarter of their farmland is not even farmable. You can go from country to country throughout the world and confront similar situations. There were two million people in the Soviet Union, unbeknownst to most Americans, who demonstrated recently on environmental issues—two million people in the Soviet Union.

My sense is that this collision is inevitable, but most of it avoidable if we display leadership now. I look forward to working with you to do that.

We made you a little late. I apologize for that. I want to say also that I am particularly grateful to you for coming up here. I think this process is important and I think the dialogue is helpful. I know that it is not altogether fun, but I do thank you for doing it and appreciate your taking the time today. Thank you very much.

Dr. BROMLEY. Thank you.

[The following information was subsequently received for the record:]

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United States Senate
COMMITTEE ON APPROPRIATIONS
WASHINGTON, DC 20510-6025

November 28, 1989

The Honorable John C. Danforth
Committee on Commerce, Science
and Transportation
SD Room 554

Dear Jack:

The question of whether Tongass reform legislation was being considered by the Administration as a means to remedy the global warming problem was asked of Dr. Bromley at the hearing two weeks ago on global warming.

I was on the floor at the time and have followed up on this line of questioning to Dr. Bromley. I meant to provide the Committee with the questions at the same time I gave them to Dr. Bromley, but they were misdirected. In the mean time, I received Dr. Bromley's answers. I would appreciate your having the enclosed questions and Dr. Bromley's answers to them inserted in the hearing record to make it more complete on this subject.

In addition I understand that Dr. Bromley will be providing the Committee with an even more accurate response to the questions about Tongass. You should be receiving this soon.

Thank you.

With best wishes,

Cordially,

TED STEVENS

Enclosure

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

SUPPLEMENTAL QUESTIONS
COMMERCE COMMITTEE HEARING ON GLOBAL WARMING
Tuesday, November 14, 1989

Senator Ted Stevens

1. **Is it true that a major global warming concern as it relates to forestry practices in Brazilian tropical rain forests is that the forests are cut and burned on location, the result being the release of massive amounts of carbon into the atmosphere?**

   Yes. The large areas of tropical forests being burned after cutting are releasing large amounts of carbon into the atmosphere. A similar result occurs from the massive burning of grasslands in Africa. However, to call the removal of tropical forests a forestry practice is not accurate. What is being done there has no relation to the practice of forestry.

2. **Is it true that this technique known as "slash and burn" agriculture is not used in the Tongass?**

   Yes. "Slash and burn" agriculture is not used in the Tongass National Forest. The Tongass is managed to produce forest crops on a continued basis and is never converted to produce food crops. In fact, forestry is practiced on the Tongass and all National Forests.

3. **Is it true that large amounts of carbon are not released into the atmosphere by burning associated with forestry practices in the Tongass?**

   Yes. Large amounts of carbon are not released into the atmosphere from harvesting the Tongass. Little, if any, burning is associated with harvesting of timber there.

4. **Is it true that by harvesting older trees, young trees are allowed to grow more rapidly?**

   Yes. It is true that younger trees will grow more rapidly after the mature timber crop is harvested. This is true because the young trees receive more light, water, and nutrients after the mature trees are removed.

5. **Is it true that young trees convert carbon dioxide at a greater rate than older trees?**

   Yes. Older stands of timber tend to begin losing limbs, foliage, etc which is broken down, releasing carbon into the atmosphere. Young stands tend to keep adding more wood as a result of tree growth, thus turning more carbon dioxide into cellulose.

6. **And is it furthermore true that as a result of harvesting old trees and allowing young trees to prosper, more carbon dioxide is converted in the photosynthetic process?**

   Yes. The net result of harvesting old trees and fostering young trees is to change the ratio of carbon fixed/released toward the fixation side.

7. **Is it true that most timber from the Tongass is used productively, not burned like timber from the Brazilian tropical rain forests?**

   Yes. Timber from the Tongass is used in a variety of products. It is not wasted.

8. **Does any component of Tongass reform legislation currently being considered by the House or Senate help to address the global warming problem?**

   It is my understanding that the Tongass Reform Legislation that has been considered addresses forestry management issues. In fact, Secretary Yeutter has urged delay of any legislation until the revised Tongass National Forest Management Plan is completed next year. This will allow for the necessary professional field review and public comment period that are part of the forest planning process.

9. **In light of these facts, is the Administration considering Tongass reform legislation to address the global warming problem?**

   No. The Administration has not proposed Tongass Reform Legislation, but instead prefers to rely on the National Forest Land Management process to address forestry management issues on the Tongass.

Answers to Questions posed by Senator John F. Kerry

Question 1. On November 7, 1989, the White House announced that the U.S. accepted the Noordwijk Declaration. In doing so, we agreed that emissions of carbon dioxide and other greenhouse gases need to be stabilized. When will the Administration propose measures to stabilize emissions of carbon dioxide and other greenhouse gases (not including CFCs)?

Question 2. The Noordwijk Declaration goes on to say that industrialized nations should set an example by initiating domestic action and reducing emissions of greenhouse gases. When will the Administration propose measures to reduce emissions of carbon dioxide and other greenhouse gases (not including CFCs)?

Answer to Questions 1 and 2. The specific timing and nature of measures to stabilize or reduce emissions of greenhouse gases will formally be discussed first in December of 1990, or early in 1991, when the President convenes world leaders to discuss a Framework Convention. Participants at these discussions will benefit from the initial results of the science, impacts, and response strategy assessments currently being developed under the auspices of the Intergovernmental Panel on Climate Change (IPCC).

The Administration currently is pursuing a number of other activities in preparation for these discussions. For example, the President has asked me, working with the Chairman of the Council of Economic Advisers and the Administrator of the Environmental Protection Agency, to convene a meeting of science, economics and environmental ministers in April of 1990 (details are given in my answer to Question 6). In addition, the Domestic Policy Council Working Group on Global Climate Change, which I chair, has initiated a set of policy-related analyses, including a much-needed focus on the economic implications of mitigation/response strategies and collection of data and input from the U.S. private industrial sector.

Given the significant environmental, social and economic implications of changes in the global climate system, the U.S. believes policy decisions must be based on strong scientific and economic foundations. We must move aggressively to reduce scientific and economic uncertainties and provide a much-improved predictive capability to support and continuously reevaluate policy decisions. The President's FY 1991 budget will reflect the strong commitment of the U.S. to lead an international scientific program to monitor, understand and predict changes in the global earth system.

Finally, with regard to the provision of the Noordwijk Declaration calling for action by industrialized countries to reduce emissions of greenhouse gases, I would note that the U.S. already has accomplished a great deal and is currently pursuing a variety of actions, for other policy reasons, that will have the effect of further reducing carbon dioxide emissions. For example, U. S. emissions of CO2 in recent years have been essentially stabilized. They are currently growing only very slowly, if at all. In 1987, U.S. emissions of CO2 from fossil fuel consumption, cement manufacture, and gas flaring were equal to emissions from the same sources in 1972. Furthermore, over that period of 16 years, average annual U.S. emissions were equal to emissions in 1972 and 1987.

In contrast, the emissions of the rest of the world grew by almost 40 percent from 1972 to 1987, an annual rate of growth of 2.2 percent.

Question 3. In the Commerce Committee hearing of November 14, you stated that there was no doubt in your mind that if we continue dumping greenhouse gases into the atmosphere, the earth's temperature will rise. Dr. Bromley, have past greenhouse emissions already committed the earth to a significant warming? If so, what is the best estimate of the range of warming?

Answer to Question 3. My view is that we do not know yet whether past emissions have committed the earth to a significant warming. We do know that the concentrations of greenhouse gases in the atmosphere are increasing, and as I noted in my testimony, given enough increase in greenhouse gases, there almost certainly will be warming eventually. Unfortunately, we do not yet know enough about lags, such as those caused by ocean absorption, and feedback mechanisms, such as changes in albedo (the reflectivity of oceans, clouds and land) to make precise predictions of future warming.

Question 4. Japan and West Germany use half as much energy per unit gross national product as the U.S. uses. Does energy efficiency not make sense from the point of view of competitiveness?

Question 5. Has the President's decision to stabilize CO2 emissions been communicated to the Secretary of Energy? Will the National Energy Strategy being developed by Energy Secretary Watkins include measures to stabilize or reduce CO2 emissions? What is the White House involvement in developing the National Energy Strategy?

Answer to Questions 4 and 5. Additional cost-effective investments in improved energy efficiency can help improve U.S. industrial competitiveness and should be a major element of the National Energy Strategy now under development. However, in making specific international comparisons of current energy consumption per capita, we must be very careful and recognize that higher U.S. levels do not necessarily imply less efficient use of energy.

For example, it should be noted that a) we are a very large country as compared to either Japan or West Germany, with correspondingly greater travel distances and fuel consumption; b) our climate is, on average, significantly colder, requiring additional energy utilization in heating; c) our military is one of our largest single energy consumers; this is a much smaller problem in either Japan or West Germany, reflecting our military role in the world; and d) many of our industrial processes still in use were developed on the assumption that energy would continue to be inexpensive and readily available so that it did not need to be factored in as a parameter when optimizing these processes economically. This is in strong contrast to the situation (particularly post-World War II, when both the Japanese and Germany industrial plants were being reestablished, with our help with the then-most-modern technologies and with energy conservation as an overt goal. To give a single example: we currently use a fluoride process in our extraction of aluminum from its ores; this is one of our most energy-intensive industrial processes. Had we instead chosen a chloride process, the energy consumption would be reduced by about one third. Unfortunately, the major capital investments represented by existing industrial plants mean that we cannot achieve such energy savings until the initial investments have been at least partially amortized. Further energy conservation in industrial processes remains one of the nation's largest opportunity areas and is one being addressed aggressively in the development of the National Energy Strategy.

My office and I are working with Secretary Watkins on the development of this Strategy, as are many other members of the Administration. I have agreed to chair, for example, one of the public meetings that Secretary Watkins is currently holding at sites across the country; we will focus in that meeting on the science and technology essential to effective energy conservation.

Question 6. Newspaper reports during the week of November 20 stated that the Administration is committed to an accelerated schedule for international negotiations. Just what is this new schedule, and what will be the goal of these negotiations?

Answer to Question 6. I believe you are referring to the following two events. First, the President has announced that the U.S. has offered to host the first negotiating session of the international Framework Convention on Climate Change of the U.N. Intergovernmental Panel on Climate Change (IPCC), following the second World Climate Conference in October 1990. The goal of the Framework Convention is to start an international process to address issues related to global change.

We believe that any Framework Convention and subsequent protocols should reflect a comprehensive view of all possible greenhouse gases rather than having a separate protocol for each, e.g., carbon dioxide, methane, ozone, etc. The comprehensive approach accommodates well to the concept of greenhouse gas equivalence indices that provide a scientific measure based both on chemical interaction dynamics and average atmospheric residence times. Once such equivalence concepts are accepted, then a market-oriented approach aimed at achieving the greatest possible greenhouse effect reduction at the lowest possible cost becomes possible. It is our intention to introduce these concepts in the ongoing IPCC meetings and discussions.

Second, the President also announced in Malta that he will be hosting an international White House meeting in the spring, to be attended by international delegations composed of the chief science, economics and environmental officials from each of the participating nations.

The focus of the meeting will be to advance the quality and understanding of the analytic tools and data available for confronting environmental problems and, in particular, global change. The anticipated result would be a common integrated approach for all nations to use in future work and negotiations on environmental problems. These results will also serve as important inputs to the G-7 Economic Summit scheduled for June 1990 in Houston.

It should be emphasized that these announcements do not reflect an accelerated schedule for international negotiations but rather an orderly development of the Administration's program for addressing global climate change.

Question 7. Please clarify for me the membership and purpose of the Domestic Policy Council Working Group on Global Climate Change.

Answer to Question 7. The President has set up a new Cabinet-level Working Group on Global Climate Change, under the Domestic Policy Council, which I chair, to ensure the development of a coherent, government-wide, aggressive U.S. policy on global climate change and other environmental issues based upon sound scientific and economic principles. The Working Group has called for a series of studies in order to compile and study the best and most up-to-date information available for policy-making. Preliminary findings from three studies are expected before the February IPCC plenary meeting. These are in the areas of: (1) economic impacts, (2) U.S. private sector activities, and (3) legal precedents for international agreements and conventions.

Additionally, early in 1990 the Working Group is arranging to meet with four groups of experts whose members have been selected by the National Academies of Sciences and Engineering; these groups represent, respectively, scientists active in greenhouse research, economists active in efforts to quantify the economic consequences of global warming, environmentalists representing major private sector U.S. environmental organizations, and senior private sector corporate executives for companies having a record of expertise, experience and data collection relevant to global climate change matters.

Members of the Working Group include Cabinet-level representatives from all the relevant Agencies and Departments and Assistant to the President-level representatives from the Executive Office of the President.

Answers to Questions posed by Senator Larry Pressler

Question 1. How great is the consensus among scientists that global warming is occurring? Do 80 % agree? 90%? 50%?

Answer to Question 1. The earth is probably warmer now than it was one hundred years ago. The warming was not uniform over time; for example, we do not know why there was a cooling trend from the 1940s to the 1970s. This overall century-long warming appears more pronounced in the atmosphere than in the oceans. However, we do not yet know whether or how much of that warming reflects human activities or natural forces, nor are we able to predict with certainty that the globe will keep warming in the short run or that whatever potential warming may occur in the short run will be due to greenhouse gases.

Although no one has conducted a survey of all scientists on the subject of global warming, it is probably the case that the majority of the scientific community would agree that were we to continue adding greenhouse gases to our atmosphere at the present rate, we would eventually experience substantial warming. But no one at present can predict the timing or extent of such warming with any certainty.

Question 2. Even if global warming is not occurring or is insignificant, what are the other effects of carbon dioxide emissions on the environment?

Answer to Question 2. A significant effect, other than potential global warming, of increased concentrations of carbon dioxide is on plants and plankton. Most plants grow faster and require less water. Carbon dioxide can act as a fertilizer to stimulate growth. Increased concentrations of carbon dioxide also tend to contract the stomata, which are small pores in the leaves that take in carbon dioxide and release water vapor.

Even if it were to happen that negative feedback loops canceled significant warming, there would probably be other impacts of increased CO2 that are difficult to predict, such as increased cloud cover or increased precipitation in some areas.

Question 3. Shouldn't we reduce carbon dioxide emission anyway?

Answer to Question 3. There are a variety of reasons why we should reduce our consumption of fossil fuels, whose combustion currently accounts for about 57 percent of anthropogenic greenhouse gas emissions. We are currently undertaking a number of actions, well-justified on other policy grounds, that also will have the effect of reducing carbon dioxide emissions. For example, the Clean Air legislation, the more stringent Corporate Average Fuel Economy (CAFE) requirements on our automobile manufacturerers and the cost-effective energy conservation that will be central to the National Energy Strategy, currently under development under the leadership of Secretary James Watkins of the Department of Energy, all will act to reduce our emission of carbon dioxide.

I believe that as a result of IPCC studies, and those in process under the aegis of the DPC Working Group on Global Climate Change, by the time of the first negotiating meeting on the Framework Convention that the President has offered to host here in Washington in December 1990 or January 1991, we will be in a position to discuss, responsibly, quantitative questions of greenhouse gas emission, stabilization and possible reduction. And in doing so, on the basis of the best possible scientific and economic information, we will be exercising very real leaderhsip in the international community.

Senator KERRY. If we could ask the next two panelists if they would come forward together, Christopher Flavin, Vice President for Research for Worldwatch, and Alden Meyer, who is the Senior Analyst, Climate Change and Energy Policy, Union of Concerned Scientists.

Gentlemen, thank you for your patience. I have your testimony in front of me, Mr. Meyer. I was going to ask some questions of Dr. Bromley based on it, but I think we did in a circuitous fashion. But we ran out of time, and I promised him because he has another meeting that we would get him out of here.

If you have opening statements that you would like to make, any comments obviously specifically relating to what you have heard with respect to The Netherlands and Administrations current strategy, we would appreciate it very much.

STATEMENT OF CHRISTOPHER FLAVIN, VICE PRESIDENT FOR RESEARCH, WORLDWATCH INSTITUTE

Mr. FLAVIN. Thank you, Mr. Chairman, for the opportunity to follow Dr. Bromley this morning. We have provided you with copies of a recent study we conducted at the Worldwatch Institute laying out a broader strategy to cope with global warming, and we are making sure this morning that additional copies of that also make their way to the White House to help in the information-gathering process that apparently is under way.

I did attend last week's climate meetings in The Netherlands and also have over the past year been following the IPCC process, as well as various national efforts to cope with global warming.

Let me say first off that I am disappointed by the progress of the Bush Administration so far. The concern is not so much the limited nature of the statement that emerged from The Netherlands last week as the fact that U.S. obstructionism makes it increasingly unlikely that we will see a comprehensive and specific treaty to slow global warming by the time of next year's world climate conference.

I think a simple slogan might describe the situation today: While Bush fiddles, the earth warms.

I was a bit surprised by some of the remarks made by Dr. Bromley on some of the scientific aspects. I think obviously he is doing as best he can to attempt to inform the President personally, but he obviously, with his training in nuclear physics and John Sununu's training in nuclear engineering, are not exactly the scientists whose disciplines are required, and I would certainly echo your call that there is a need for a real scientific briefing of the President that would involve the best atmospheric scientists who are studying these issues.

The best guiding principles that we have seen from the Administration so far, I believe, are those made by Secretary of State James Baker soon after he took office last January. At the time, he stated, "we can probably not afford to wait until all of the uncertainties have been resolved before we do act. Time will not make the problem go away." He went to argue for a number of prudent and already economical policies.

Interestingly, it is this set of principles that has already been embraced at the State level, at the local level in this country, and in several European countries at the national level.

The wait and study approach of the U.S. Government at least week's ministerial meeting was an embarrassment, frankly. The United States, which is ahead of the curve in global warming science and political rhetoric, is well behind in developing effective policy responses. The Administration led the way in scuttling the proposed conference commitment to stabilize carbon dioxide emissions by the year 2000.

Here I might differ again with Dr. Bromley. He indicated that this commitment was way too specific in terms of amount and in terms of dates to be acceptable to the Administration, that we would somehow be tied in to something that might damage our economy.

The commitments that were proposed by other countries at the conference were actually fairly general ones and simply would have set the tone for continuing negotiations at IPCC. Again, I think we can see that obstructionism is the real motive here.

And while the Administration argues that The Netherlands conference was only one of many possible fora for moving forward on global warming, a pattern is evident here. After a year in office, the Bush Administration has failed to endorse any part of the excellent and comprehensive legislation now before the U.S. Congress on global warming, and it has also failed to propose or even to discuss seriously, we gather, policies of its own.

The fact that the United States, with five percent of the world's population is contributing about one-quarter of the enormous and, for practical purposes, irreversible changes to the atmosphere each year seems not be understood at the White House, nor that at a time when atmospheric scientists believe that we must substantially cut carbon dioxide emissions in order to stabilize the climate the fact that U.S. emissions have shot up by six percent just in the past two years.

Again I might clarify. Dr. Bromley argued that we have only seen a 0.4 percent per year increase in emissions. He was referring to global concentrations, not to emissions trends, which in fact are rising far more rapidly, with the U.S. leading the world charge at this point, unfortunately.

The Administration has also argued that we have to wait for a global agreement before we can have national action. I think this is untrue. The industrial countries, including the United States, have created at least 80 percent of the problem so far, and only their actions can turn the global trend around in the immediate future.

Sweden, Norway, The Netherlands and West Germany are considering and in some cases enacting such policies. The United States is not.

I might say that I think some of these countries would be rather shocked to hear Dr. Bromley's description of their commitments and programs to be somehow hollow. The degree of concreteness with which these various countries have studied and begun to implement policies I think far exceeds anything in this country. And I really am a bit shocked to see the President's Science Advisor

really insulting some of our industrial country allies in this obvious way.

Contrary to the Administration's rhetoric——

Senator KERRY. Well, do you buy the notion he says he has only been here since August. Is there an element of fairness in saying he has really only had a couple of months to move the process?

Mr. FLAVIN. I think that is true, but he did spend several days in The Netherlands discussing their specific policies with some of these countries, and obviously he got the wrong impression there. But I have found a lot of very concrete proposals that I am frankly quite impressed by in a number of these countries.

Senator KERRY. Do you want to set some of those out here? Just give us a quick example. What kind of concrete proposals?

Mr. FLAVIN. They are mainly in the area of energy efficiency programs, specific programs to reduce carbon emissions over time.

Senator KERRY. Is there any question in your mind that there are plenty of options available in the United States with known technologies now that we could be implementing if we had the intent?

Mr. FLAVIN. There are an enormous variety of options and, again contrary to Dr. Bromley's argument, many of these have been laid out in extraordinary detail not only by groups such as mine but also, for example, by a major Environmental Protection Agency study that was completed in the early part of this year. Very detailed not only technology options but policy proposals are in fact on the table.

I might say as well, in response to the argument that somehow there has not been time yet to discuss fully with the scientific community or with the environmental community how to address these problems, we have written several letters to the White House on these issues, have certainly sent them everything we have produced in the way of substantive studies, and have not yet received any invitations to discuss these issues with them.

There are policies that are safe, prudent and economical in their own right, a fact that the Administration seems to still be at least pretending that it does not understand.

The argument continues to be made that many of these policies would be economically disruptive, as we heard this morning. This not only violates the previously-stated Baker principles of a safe insurance policy, it ignores the fact that virtually all of the policies and programs being seriously proposed would yield net economic benefits. This is in effect an insurance policy that will pay real dividends as well as protecting against the likelihood of global disaster.

What the Bush Administration has failed to note on the issue is the fact that its positions are determined less by its science advisors questioning the consensus of atmospheric scientists but by the concerns of its powerful constituents that Senator Gore alluded to, such as the oil industry, the coal industry, and the electric utilities, each of which has indicated repeatedly its vehement opposition to any effective strategy to slow global warming.

There is no point, of course, in pretending that slowing global warming will not require economic adjustments. Some industries, such as CFCs and coal, will decline, while others, such as renew-

able energy, energy conservation and tree planting will increase. Overall, however, a country with an effective climate stabilization policy is likely to have cleaner industries, more jobs, and less air pollution as well as a more stable climate.

I would like to conclude with a few suggestions on some specific things the Bush Administration could do to demonstrate the seriousness of its commitment to slowing global climate change in the next year.

The first would be to address global warming in the State of the Union message early next year and then immediately send legislation to Congress. Bills already introduced in both the Senate and the House obviously provide excellent examples. As in arms negotiations, unilateral initiatives can be the spark that accelerates negotiations leading to international agreements.

Second is for the President to direct the Secretary of Energy to include the need to limit carbon dioxide emissions by 20 percent by 2000 in the national energy strategy that he is now preparing. So far, Secretary Watkins has been listening hard to his industry constituencies but has given no indication that global warming will play a central role in his strategy. That document is in danger of becoming irrelevant the day it hits the President's desk.

I might say that most of the programs that have been discussed today with Dr. Bromley that have the immediate potential to reduce carbon dioxide emissions in the next few years, such as energy efficiency, have seen precipitous declines in recent years and so far there has been no major effort by the Bush Administration to boost those budgets up, so that we are, for example, spending a tiny fraction on energy efficiency compared to what we are spending on a number of very outdated nuclear technologies.

The third priority, I believe, is to direct one Administration official, perhaps the Secretary of State, to coordinate a strong Administration position as international deliberations pick up speed next year. That official should be charged with stopping the interagency warfare and scientific nitpicking, making it clear that the Administration wants to see a comprehensive and detailed agreement signed as soon as possible.

A broad framework convention on the global atmosphere could be agreed to as early as next year. Such a convention would commit the world community to stabilizing the atmosphere as soon as possible, noting the need to cut emissions of all major greenhouse gases in the industrial countries, beginning immediately, not waiting until later.

The convention would also include the principle that industrial nations have the responsibility to assist developing countries to develop energy and land use policies that are consistent with a stabilized global atmosphere. This convention could then be followed in 1992 at the latest, I believe, by specific protocols to cut emissions of carbon dioxide and other greenhouse gases by specific amounts, with the rate of reduction being tied to the country's per capita emissions rates.

This would put the primary burden where it belongs, on the industrial countries that have caused most of the problem. In addition, new global instruments, in conjunction with the United Na-

tions and the World Bank, will be needed to carry out this agreement.

The question ultimately then is U.S. leadership. A global warming agreement is coming. The United States has the choice of continuing to obstruct progress or playing an appropriate leadership role. As the rapid developments in Eastern Europe this past week demonstrate, the winds of world change have become a hurricane, and a primary item in the new world order will be protection of the global environment.

Thank you, Mr. Chairman.

Senator KERRY. Thank you very much, Mr. Flavin. Mr. Meyer?

STATEMENT OF ALDEN MEYER, SENIOR ANALYST, CLIMATE CHANGE AND ENERGY POLICY, UNION OF CONCERNED SCIENTISTS

Mr. MEYER. Let me just touch on a few key points. I am assuming you will enter my full statement into the record.

I was also at the conference last week in Noordwijk and I am sad to report my opinion that the position taken by the United States there did not begin to live up to the rhetorical commitments made by President Bush first during the campaign last year and at the July economic summit in Paris.

In fact, I think the refusal of the American delegation to consider any meaningful commitment to stabilize, much less begin to reduce, emissions of CO_2 positioned the U.S. as the major roadblock to international action on this important issue. I believe if we had taken leadership on this point we could have convinced Japan, the Soviets and a few other holdout nations to go along with a meaningful specific commitment to stabilize CO_2 at a date certain and at levels specified at the conference.

At the conclusion of the conference Bill Reilly told the press corps "We did not come here prepared to make a commitment to stabilize emissions by the year 2000." I think it is clear the internal divisions and wrangling that is going on within the Administration is causing a policy paralysis.

Dr. Bromley stated his belief to the press that more research and economic analysis was called for before firm commitments were made, and the President himself, I understand, when asked about the U.S. refusal to join in the majority position on CO_2 stabilization, told the press here last Tuesday that "we're just standing off against extremes. You can't take a policy and drive it to the extreme and say to every country around the world you aren't going to grow at all."

I should just add here I think as long as the President believes that any meaningful attempt to stabilize and reduce CO_2 means no growth and economic hardship, we are going to be up against the wall and we have got to disabuse him of that mistaken belief.

The Administration's position is clearly a political non-starter in the quickening international debate over the action steps needed to avert climate change. It also flies in the face of mounting calls for action from the scientific community.

Just contrast the U.S. stance with a few other statements by environmental ministers at Noordwijk. Dr. Klaus Topfer, Minister of

Environment for West Germany, said: "The time to act is now, even if we have not yet reached any definitive scientific certainty about the causal interrelations and future development of climatic changes. The continually growing emissions of CO_2 throughout the world demand immediate action by using energy sparingly and efficiently. We believe it is necessary to stabilize CO_2 emissions by the year 2000; a 20 percent reduction by the year 2005 must be urgently examined. Progress in this field is not a utopian dream."

I should add here I believe Germany knew exactly what it was committing to when it supported the majority position for CO_2 stabilization.

The Canadian Environment Minister, Lucien Bouchard, said: "The message is clear—global warming would alter the global ecosystem and dramatically affect all life on this planet. If we delay action, we will increase the risk and magnitude of the problem. We believe there is a need to stabilize CO_2 emissions at their present levels as soon as possible. All options must be considered. National creativity must be harnessed. But we must start. I think we must address these issues in generational terms"—and this ties into the point you made while Dr. Bromley was here. "We must consider our responsibility for ensuring that the child born today does not in 2010 inherit these same problems. That would not be just irresponsible but immoral."

I believe that Minister Bouchard knew what he was committing Canada to when he went along with the majority position on CO_2 stabilization.

Finally, Dr. Tolba, a scientist himself and head of the United Nations Environmental Program, said: "I fully recognize there is a great deal we do not know even from the most sophisticated atmospheric models, but it is almost a virtual certainty that our planet faces unprecedented climate change. In the face of catastrophic possibilities, we cannot await empirical certainty. We know enough right now to begin action."

You do not have to have been at Noordwijk to realize in the context of these statements how backward and small-minded the United States position appeared. It should be evident that continuation of this politically unviable stance will rapidly diminish any chance the U.S. may still have to play a leadership role in the world on climate change issues.

Given that these issues seem destined to join arms control as the primary focus of international diplomacy in the 1990s, this abdication of leadership will have no small impact on America's reputation on the global stage.

If the U.S. position is bad politics, it is worse science. It flies in the face of scientific conservatism, the principle that in the face of uncertainty prudent actions are warranted so as to minimize the risk of worst case projected outcomes.

The evidence is accumulating. I do not think I need to go into great detail on this after the exchange between Senator Gore and Dr. Bromley. But just let me say that Dr. Bert Bolin, who is one of the most renowned atmospheric scientists in the world and chairman of the IPCC, laid out very clearly the range of expected temperature changes from current emissions and from business as

usual continuation of emissions—a total of 1.5 to 5 degrees centigrade change in the equilibrium temperature of the world.

Let me just put that in some context. That would represent going back 15 to 38 million years in the earth's geological history to find a period that was five degrees warmer than current temperatures.

Dr. Woodwell, noted ecologist and president of the Woods Hole Research Center in your own State, testified to this committee last May that, "While there are clear limitations on the abilities of scientists to prove details of how the world works and to predict climate changes or their consequences for the human enterprise, the probable consequences of failure to act now to stabilize composition of the atmosphere and to stop the further warming of the earth due to human activities are so profound as to constitute a folly as great as global nuclear war."

And at that same hearing Dr. Jerry Mahlman of NOAA's Geophysical Fluid Dynamics Lab stated his best estimate of the probabilities associated with climate responses to greenhouse gas concentrations. He gave a nine out of ten chance that we would experience long-term global surface warming in the range of 1.5 to 4.5 degrees celsius, the same probability for an increase in global mean precipitation, winter warming of the northern polar surface air, and a consequent reduction of polar sea ice.

He gave a two out of three probability to a marked decrease in summer soil moisture in interior continental regions—i.e., more drought—and a rise in global mean sea level. Other impacts, including vegetation patterns and intensity of tropical storms, he put in a more uncertain category.

I think all these statements and others that have been mentioned today by respected scientists give weight to the points made by Strobe Talbott in his very excellent column in the November 6 issue of Time magazine. He said: "There is room for debate over the exact magnitude of climate change that will result from CO_2 emissions, but no respectable scientist denies that if humanity keeps pouring gases into the atmosphere that the earth will heat up. The U.S. has spent several trillion dollars over the past 40 years buying insurance against a Soviet nuclear attack. Global warming, by contrast, is not just a risk but a certainty. It would be s shame if quibbling and ambivalence on the part of some Bush aides were to play into the hands of those who are looking for an excuse to do nothing."

Unfortunately, I think the Bush Administration's divisions and policy paralysis is doing that right now.

I think, as Chris said, we have to realize the Administration's position is a value judgment based on their short-range concern for the impact on powerful domestic industries and not a reaction to the risks and consequences based on the science. It is a gamble that I hope Congress and this Committee will join other nations in the world in asking the Bush Administration not to take.

Thank you.

[The statement follows:]

Testimony of

Alden M. Meyer
Director, Climate Change and Energy Policy Program
Union of Concerned Scientists

Senator Kerry and other members of the Committee: my name is Alden Meyer, and I am Director of the Union of Concerned Scientists' Program on Climate Change and Energy Policy. I appreciate this opportunity to present my views on the positions taken by the Bush Administration at last week's Ministerial Conference on Atmospheric Pollution and Climate Change.

I was at the conference in Noordwijk last week; I observed those parts of the conference that were not closed to the public and the press, attended many of the numerous press briefings held by conference officials and national delegations, and spoke to many of the ministers and senior officials in attendance from some 70 nations.

I am sad to report that, in my opinion, the position taken by the United States at Noordwijk did not begin to live up to the rhetorical commitments made by President Bush during last year's campaign and at the July economic summit in Paris to provide international leadership on the global warming problem. In fact, the refusal of the U.S. delegation to consider <u>any</u> meaningful commitment to stabilize, much less begin to reduce, emissions of the most important greenhouse gas, carbon dioxide, positioned the United States as the major roadblock to international action on this important policy issue.

The draft declaration circulated in advance of the Noordwijk conference called for agreement by industrialized countries as to "the need to stabilize CO_2 emissions at present levels not later than the year 2000," a limited, but important, first step in the vital effort to avert widespread climatic change in the next century.

This goal should be put in the context of the call for a global 20% reduction in CO_2 emissions by the year 2005 issued by over 300 scientists and policy makers from 46 nations at last year's World Conference on the Changing Atmosphere, hosted in Toronto by the Canadian government. It also should be contrasted with the likely requirement to make eventual cuts in CO_2 emissions in the range of 50 - 80% if we are to stabilize (much less reduce) atmospheric concentrations of carbon dioxide.

The hardline stance of the U.S. delegation resulted in a watered-down final statement recognizing the need to stabilize emissions of CO_2 and other greenhouse gases "as soon as possible, at levels to be considered [in] November, 1990" -- hardly a stirring call to action! The majority of industrialized countries (but not the U.S.) specified that stabilization of CO_2 emissions should be achieved at the latest by the year 2000.

At the conclusion of the conference, EPA Administrator Reilly told the international press corps that "We did not come here prepared to make a commitment to stabilize emissions by the

year 2000." The President's science advisor, Dr. Bromley, stated his belief that more scientific research and economic analysis were called for before any firm commitments were made. And the President himself, when asked about the U.S. refusal to join in the majority position on CO_2 stabilization at Noordwijk, told the press last Tuesday that "We're just standing off against extremes...You can't take a policy and drive it to the extreme and say to every country around the world, 'You aren't going to grow at all.'"

The Bush Administration's position is clearly a political non-starter in the quickening international debate over the action steps needed to avert the potentially disastrous consequences of rapid climate change. It also flies in the face of mounting calls for action from the scientific community.

First, let me touch on the international political context. Contrast the U.S. stance with the following statements by other environmental ministers at the Noordwijk conference:

"The time to act is now, even if we have not yet reached any definitive scientific certainty about the causal interrelations and the future development of climatic changes ... The continually growing emissions of CO_2 throughout the world demand immediate action by using energy sparingly and efficiently ... We believe it is necessary to stabilize CO_2 emissions by the year 2000. A 20% reduction by the year 2005 must be urgently examined. Progress in this field is not a utopian dream."

-- Dr. Klaus Topfer, Minister for the Environment, Nature Conservation and Nuclear Safety, Federal Republic of Germany.

"Scientists also generally agree that continued emissions of greenhouse gases will result in significant global warming. Such warming is anticipated to occur at a rate likely beyond the realm of previous human experience ... The message is clear; these changes would alter the global ecosystem and dramatically affect all life on this planet. If we delay action we will increase the risks and magnitude of the problem ... We believe there is a need to stabilize CO_2 emissions at their present levels as soon as possible ... All options must be considered. National creativity must be harnessed to provide new options and alternatives. But we must start ... I think we must address these issues in generational terms. We must consider our responsibility for ensuring that the child born today does not, in 2010, inherit these same problems. That would not be just irresponsible but immoral."

--The Honourable Lucien Bouchard, Minister of the Environment for Canada.

"As a scientist, I fully recognize there is a great deal we do not know even from the most sophisticated atmospheric models. But it is almost a virtual certainty our planet faces unprecedented climate change ... In the face of catastrophic possibilities, we cannot await empirical certainty. We know enough right know to begin action ... We are embarking on an unprecedented pattern of international cooperation. We do not have too many options. No country alone can save itself. This is the real coming face to face with interdependence. Let us seriously discuss how we are going to face up to the challenge."

-- Dr. Mostafa Tolba, Executive Director, United Nations Environment Programme.

You don't have to have been at Noordwijk to recognize how backward and small-minded the United States' position appeared in the midst of these and many other similar calls to action. It should be evident that continuation of this politically unviable stance will rapidly diminish any chance the U.S. may still have to play a leadership role on climate change issues. Given that global warming and other environmental issues seem destined to join arms control as the primary focus of international diplomacy in the 1990s, this abdication of leadership will have no small impact on America's reputation on the world stage.

If the U.S. position is bad politics, it is worse science. It flies in the face of scientific conservatism: that, in the face of uncertainty, prudent actions are warranted so as to minimize the risk of worst-case projected outcomes.

The evidence is accumulating on global warming. As Dr. Bert Bolin, a reknowned atmospheric scientist at the University of Stockholm and Chairman of the Intergovernmental Panel on Climate Change, told the Noordwijk conference:

"The increase of greenhouse gases in the atmosphere during the last two centuries is equivalent to an increase of atmospheric carbon dioxide by more than 40%, which corresponds to an increase of the equilibrium temperature of the earth by 0.8 - 2.2 Degrees celsius, and a most plausible value of 1.5 degrees C ... 'Business as usual' would imply a tripling of the use of fossil fuel during the next 35-40 years, marked increases of emissions of CFC-gases, methane, nitrous oxide and higher concentrations of tropospheric ozone, which would lead to a further increase of the equilibrium temperature of the earth by 1 - 3 degrees C by 2025 - 2030.

Dr. George Woodwell, noted ecologist and President of the Woods Hole Research Center, testified to this committee last May that:

"While there are clear limitations on the abilities of scientists to prove details of how the world works and to predict climatic changes or their consequences for the human enterprise, the probable consequences of failure to act now to stabilize composition of the atmosphere and to stop the further warming of the earth due to human activities are so profound as to constitute a folly as great as global nuclear war."

At the same hearing, Dr. Jerry Mahlman, Director of the

National Oceanic and Atmospheric Administration's Geophysical Fluid Dynamics Laboratory, stated his best estimates of the probabilities associated with various climate responses to increased greenhouse gas concentrations. He said it was "very probable" (9 out of 10 chance) that we would experience a long-term global-mean surface warming calculated to be in the range of 1.5 to 4.5 degrees C., an increase in global-mean precipitation, an effective winter warming of northern polar surface air of as much as 10 degrees C., and a consequent reduction of polar sea ice. In the "probable" category (2 out of 3 chance), he included the following effects: a marked decrease in summer soil moisture in mid-latitude interior continental regions, increased precipitation in northern high latitude regions, and a rise in global mean sea level. Other impacts, including changes in regional vegetation patterns and increased frequency and intensity of tropical storms, he put in the "uncertain" category.

These statements by respected scientists give weight to the points made by Strobe Talbott in the November 6th issue of Time:

> "There is room for debate over the exact magnitude of climate change that will result from CO_2 emissions, but no respectable scientist denies that if humanity keeps pouring gases into the atmosphere, the earth will heat up. The U.S. has spent several trillion dollars over the past 40 years buying insurance against a Soviet nuclear attack. Global warming, by contrast, is not just a risk but a certainty. It would be a shame if quibbling and ambivalence on the part of some Bush aides were to play into the hands of those who are looking for an excuse to do nothing."

Unfortunately, the internal divisions and resulting policy paralysis within the Bush Administration are doing just that.

Finally, the Administration's position should be seen for what it is: a value judgment based on short-range concern for the economic impact of substantial greenhouse gas reductions on some very powerful domestic industries, not a considered reaction to the probable risks and consequences of rapid climate change based on the science. Given the substantial probability of serious climatic changes discussed earlier, it is the Bush Administration "no-action" policy, not the proposal to stabilize CO_2 emissions, that is the true "extreme" position.

As Dr. Stephen Schneider of the National Center for Atmospheric Research testified to the House Energy and Commerce Committee in February of this year:

> "If we choose to wait for [an] added degree of certainty, then this is not a cost-free delay, for it must be done at the price of forcing us and other living things to have to adapt to a much larger dose of change than if we were to act today to slow down the change or to invest affirmatively to make our future adaptations easier. Wrangling over a few tenths of a degree in the historic global temperature trends in this hemisphere or that will not change the fact that postponing action is a basic gamble."

It is a gamble that the vast majority of nations represented at last week's conference in Noordwijk were unwilling to take. It is, I daresay, a gamble that the vast majority of Americans would be unwilling to take, if the question were put to a national referendum. And it is a gamble that I hope this committee, and the rest of the Congress, will make clear to the Bush Administration is not acceptable -- scientifically, politically, or morally.

Senator KERRY. I thank you both for that important testimony. Let me play devil's advocate for a minute, if I may. You know my position so I do not think I run any risks in doing so.

Dr. Bromley sat there and said: We are not talking about doing nothing. You read an eloquent statement but that is not really what faces us. We are not ignoring the reality. I agree with you there is going to be warming. Yes, there is a catastrophe down the road. The question is, what do you do and what is going to be the cost.

Now how do you respond to that position?

Mr. MEYER. I think there are a couple of points there. First of all, the lag time in changing our energy policies and beginning to reduce CO_2 emissions will be great. There will be consequences and changes that we will have to make and it is going to take a period of time to do that.

As has been stated, CO_2 emissions in the U.S. are rising at three percent a year. Getting them down to stabilization and then beginning to reduce them is not going to be an easy task. Every year we delay we are making that task harder and making the reductions we will eventually need to take much more dramatic.

Senator KERRY. So in effect you are saying that if they had come out of The Netherlands with a policy to stabilize, there are certain effective steps they could take today to reach stabilization?

Mr. MEYER. I think the energy efficiency measures that have been discussed, CAFE standards, efficient lighting, utility involvement and demand side management programs, boosting renewable energy R&D, reforestation—there are a number of things that can be put together and cumulatively will not only allow us to stabilize CO_2 but begin to make serious reductions in CO_2 by the turn of the century.

Senator KERRY. Do you believe there is a large measure of uncertainty regarding the level of reduction you can get for implementing a specific program?

Mr. MEYER. I think we probably have some of the best analysis of the potential of energy efficiency in the world, and the question is not more analysis. The question is leadership. The question is making this the moral equivalent of war, as President Carter tried to do in the last years of his Administration.

We saw the U.S. respond to the price shocks from the Arab oil embargo between 1973 and 1986. The U.S. economy grew 35 percent in that period, and in 1986 we used the same amount of energy as in 1973, saving $150 billion a year, effectively, in energy outlays over that period compared to 1973 efficiency levels.

Japan and West Germany are still almost twice as efficient as we are, and they are increasing their rate of efficiency gains. It can be done. There is no question about it. But it does take leadership. It takes Presidential leadership. It takes leadership at the State level. It takes regulations and standards and price signals, possibly down the road CO_2 taxes or other measures to make it happen.

The question is not the technological potential; the question is the political policies, and I think the impact on various industries of those policies.

Mr. FLAVIN. Let me just add a small point here, which is that there is an incremental quality to energy efficiency programs, so

there is not a big downside risk in attempting to put these policies that Alden has described in place. We will know each year as we go by to what extent a particular program is being successful and to some extent it is inevitable that we will fine-tune things over time.

But it is not as if you in one year put a 20-year program in place and then sort of bear the consequences. I think that Dr. Bromley really hit the nail on the head when he admitted the fact that we have an energy system in this country that is really designed in some sense to be inefficient, to waste large amounts of energy, and if we had a real commitment to national least-cost planning and to real energy efficiency I do not think there is any doubt but that we could see not only stabilization but gradual declines in carbon dioxide emissions.

Senator KERRY. What did you think of Dr. Bromley's schedule that he laid out with respect to the IPCC and next year's November meeting?

Mr. FLAVIN. The thing he was not so specific on was the question of exactly what would be accomplished by the time of the November meeting. I think if we just have a very general sort of commitment along the lines of what some countries wanted at the Netherlands conference, that would not be much of a step forward.

I think that by late next year we should have a very specific agreement committing countries to particular levels of carbon dioxide reductions. I think that really all that Dr. Bromley committed to, if you take him sort of word for word, was simply to make another really rhetorical statement at the end of next year that we want to eventually stabilize greenhouse gas emissions.

I do not think that would be much of a step forward.

Mr. MEYER. Let me just make a comment on that because I think this goes to the politics of the issue. We support the IPCC process. We want to see that move forward. It is essential to get the developing countries on board in that process and eventually negotiate a global treaty and CO_2 protocols.

But realistically that is going to take several years and a lot of haranguing about the debt situation, technology transfer, financial aid to the south from the north. There are going to be issues raised in that process which will make arms control negotiations look easy, and I think we should not be fooling ourselves to think that we are going to negotiate some global treaty magically as soon as the IPCC reports next November.

What we think is needed is a two-track strategy where we participate fully in the IPCC process and provide leadership in it, but also the industrial nations of the world take joint action in advance of a global treaty to begin to stabilize and reduce their emissions.

I think it is important to point out Dr. Bromley says the agreement did not apply to developing countries. Of course it did not. We are emitting four tons per capita of CO_2 year in this country; the developing world is contributing .1 to .5 tons per capita. There is no way the same kind of timetables and schedules and emission reductions that fit the United States are going to be accepted by Bangladesh or India.

Senator KERRY. But to what degree do they have to accept restraints with respect to their growth? I mean, if we shift from

using fossil fuels, can they simply take that as license to get up to our level of use? Can the world afford for them to industrialize and develop along the same lines we did?

Mr. MEYER. Clearly it cannot afford for them to replicate our mistakes in terms of inefficiency in basing their economies on fossil fuel.

Senator KERRY. Well, do they not have to be brought in, therefore, to some agreement?

Mr. MEYER. Yes. They need to be brought into an agreement, but to be part of that agreement they need to see that they are going to have the technology transfer and financial assistance so they can develop their standards of living without increasing their greenhouse gas emissions. And that means efficiency technology. It means renewables. It means giving aid to China, for example, to build efficient refrigerator production plants rather than the one they just built two years ago which now is going to require 50 to 60 additional coal units, power plants, to fuel the inefficient refrigerators being provided.

It is those kinds of measures that we need to help the developing nations take. We cannot say to them you cannot grow, your economies cannot develop, your standard of living cannot increase. We can say we want to help you avoid the mistakes we made in doing that.

Senator KERRY. Obviously, if we are sitting there with our own mistakes we are certainly not in a position to leverage any of those kinds of agreements anywhere in the world.

Mr. MEYER. We have no moral suasion right now over Brazil or Third World countries on this issue.

Mr. FLAVIN. I think the argument, too, that the Administration makes that developing countries are somehow standing in the way is really disingenuous. In fact, a number of developing countries have been in the forefront, pointing out that their populations, especially their poor populations, are likely to be the big early losers in a warmer world, and in fact many would like to move forward with negotiations and an accord.

I think that if we had the kind of leadership that we are all arguing for this morning, we would see developing countries eagerly be part of a fair global warming agreement.

Senator KERRY. Well, I want to thank you for taking time. I have to go over to the Senate chamber to preside in a few minutes, so I need to call this discussion to an end. I appreciate your testimony very much. I think it is important, obviously, to keep—I was going to say keep the heat on, but I am not sure that is appropriate.

Mr. MEYER. Maybe the light will go on if the heat is up.

Senator KERRY. Turn the energy efficiency up on this and see if we can continue to demand accountability. I think the message may be getting through slowly. But it occurs to me that this Administration may face a very rude awakening in the course of the next year as we begin to see the environmental efforts around the world take hold—not only with Earth Day but in a number of other forums.

I think they may regret their reticence to provide leadership, because once again I think the people of many of these countries are

way, way ahead of their politicians. That indeed may be yet another lesson repeated rather than learned.

So I thank you for your testimonies. I certainly look forward to pursuing this issue with you. Thank you.

We stand adjourned.

[Whereupon, at 11:36 a.m., the Committee adjourned.]

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